

Accounting and Business Research

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Incorporated by Royal Charter, 11 May 1880

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External opportunity cost

We shall define this as the difference between net cash outflows if the opportunity is accepted and those if it is rejected. In practice this will often be equal to the current buying prices of the various input factors to be used.⁵

Internal opportunity cost

The internal opportunity cost of a particular course of action will be defined as the contribution which will accrue to the firm from alternative activities only if the project under consideration is not accepted.⁶ There are, broadly speaking, two sets of circumstances which may give rise to internal opportunity costs. The first, where projects are mutually exclusive (acceptance of one of them precludes acceptance of the others), may be handled with no more difficulty than is involved in calculating external opportunity cost: the foregone alternatives are easily identified and their values to the firm are their contributions.

The second case, where one or more of the resources of the business is scarce, is more difficult.⁷ It may not be easy to identify those alternatives whose acceptance depends on the rejection of the opportunity under consideration. An ideal measure of internal opportunity cost will ensure that all activities included in the optimal plan are better, in terms of the firm's objective, than the best alternative use of the scarce resources.⁸

Baxter and Oxenfeldt provide an ingenious interpretation of the margin added in the cost-plus formula

for overheads and profit as an attempt to provide a measure of the value of scarce resources: '... if it is regarded as a *price per unit* – for example, the firm's estimate of the best average price to charge per man-hour for the service of converting direct materials into finished goods – it may be both useful and intellectually defensible. The price quoted for a job could then be regarded as avoidable cost plus a processing charge – with no mention of overhead cost.'⁹ The difficulty remains, however, of the means available for calculating the size of the margin. A fixed percentage of some other sort of cost is unlikely to reflect changing scarcities of particular resources.

Opportunity cost with one scarce resource

Let us consider, as an example, a firm having two production opportunities, Y and Z, available at the time of determining its optimal plan.¹⁰ Details are given in Table 1. Suppose that in the coming year the firm expects to have available only 32,500 machine hours and that this figure cannot readily be increased. Let us further assume that production of one unit of Y requires 10.0 machine hours and one unit of Z, 6.25 machine hours. All other input factors are expected to be available in any quantity likely to be required at the external opportunity costs shown in Table 1. There is no effective limit on the quantity of each product that can be sold at the prices

⁵For a more comprehensive treatment of external opportunity cost see B. V. Carsberg, *Introduction to Mathematical Programming for Accountants* (George Allen & Unwin, 1969), pp. 13–26.

⁶The contribution from a particular course of action is defined as the difference between its incremental revenue and its external opportunity cost.

⁷A resource may be said to be scarce when a firm has insufficient supplies of it to undertake all projects with positive contributions.

⁸By the nature of the problem the best alternative use will not be known until the optimal plan is derived.

⁹W. T. Baxter and A. R. Oxenfeldt, *op. cit.*

¹⁰This is an extremely simple example of a multi-product firm but a useful one for the purposes of exposition as it avoids excessive computational complications. Conceptually we could extend the analysis to firms considering a wide range of product lines and ultimately to the firm producing individual goods to order.

¹¹For the purposes of this analysis we shall assume that the time value of money may be ignored. Consequently to maximise present worth the firm must maximise total (undiscounted) contribution to fixed costs and profit.

TABLE 1

| Product | Y | | Z | |
|---|-----|------|-----|------|
| | £ | £ | £ | £ |
| Selling price per unit | | 12.0 | | 10.5 |
| Less | | | | |
| External opportunity cost per unit: | | | | |
| Materials | 4.5 | | 3.5 | |
| Labour | 1.8 | | 3.0 | |
| Machine user cost | 3.2 | | 2.0 | |
| | — | 9.5 | — | 8.5 |
| | | — | | — |
| Contribution to fixed costs and profit per unit sold: ¹¹ | | 2.5 | | 2.0 |

shown in Table 1.¹² To determine the optimal production plan we first find the contribution yielded by each product for each unit of the scarce resource (machine hours) it utilises.¹³ The figures appear in Table 2. As product Z makes the more efficient use of scarce machine time the firm should apply all the available machine hours to producing it.¹⁴ We obtain the production plan shown in Table 3.

TABLE 2

| Product | Y | Z |
|-------------------------------|-------|-------|
| Contribution per unit | £2.50 | £2.00 |
| Machine hours per unit | 10.00 | 6.25 |
| Contribution per machine hour | £0.25 | £0.32 |

TABLE 3

| Product | Planned production | Total contribution |
|---------|-------------------------------|----------------------------------|
| Y | 0 | £0.0 |
| Z | $\frac{32,500}{6.25} = 5,200$ | $5,200 \times £2.00 = £10,400.0$ |
| | | £10,400.0 |

This plan can be demonstrated to be optimal by considering the effect of transferring to the production of Y one of the machine hours presently being applied to producing Z. Total contribution will fall by £0.32 and increase by £0.25, a net decrease of £0.07. It is not worthwhile to substitute production of Y for production of Z as the contribution Y produces per unit of scarce resource is smaller. Similarly it will not be profitable to substitute any new production opportunity for Z unless it yields a contribution greater than or equal to £0.32 for each machine hour it uses. £0.32 is the internal opportunity cost of one machine hour. We may appraise a new opportunity by calculating the contribution it produces (incremental revenue less external opportunity cost) and deducting the internal opportunity cost, based on the quantity of the scarce resource it requires. If the answer is positive the new opportunity is worthwhile as a substitute for Z.¹⁵ This illustrates that the relevant cost of a particular course of action in a situation where only one resource is

scarce may conveniently be defined as the total of external opportunity cost and internal opportunity cost, the latter representing the contribution from the best alternative use of the scarce resource.

Opportunity cost with more than one scarce resource

Let us now assume that the same firm, in addition to its machine time constraint of 32,500 hours, has available only 20,000 hours of executive management time. It is estimated that to produce and sell each unit of Y will require 4.0 executive management hours and to produce and sell each unit of Z, 7.5 hours. How are we now to determine our optimal production plan? If we decide to commit all our resources to production of Z (which produces the higher contribution for each machine hour used) we are ignoring the extra contribution yielded by Y per executive management hour required (£0.625 as opposed to £0.267 for Z) and *vice versa* if we decide to switch all our resources to production of Y. In fact, the optimal solution includes both Y and Z and there is no easy way of finding it by calculating contributions per unit of scarce resource. We must turn to a more powerful tool. The most popular of those available, for solving problems such as this, is linear programming.¹⁶

Let y and z equal the quantities of products Y and Z to be produced and sold¹⁷ during the year. We can formulate the linear programming problem as follows:

$$\text{Maximise } C = 2.5y + 2.0z \quad (1)$$

$$\text{Subject to } 4.0y + 7.5z \leq 20,000 \quad (2)$$

$$10.0y + 6.25z \leq 32,500 \quad (3)$$

$$y, z \geq 0 \quad (4)$$

(1) is the objective function which represents the contribution from making and selling y units of Y and z units of Z. We are required to maximise this contribution. (2) and (3) impose the restrictions that the plan must not require more than the maximum available amounts of executive management and machine time. (4) is a non-negativity constraint, a technical requirement to prohibit a solution including negative production quantities of Y or Z. Solving the problem, we find values of 2,375 for y and 1,400

¹²The lack of demand restrictions implies that the firm is a 'price taker'. If this is not the case additional constraints may be included in solving the problem to ensure that planned output of a product does not exceed the quantity likely to be demanded at the proposed price.

¹³This is a well-known method of product selection where one resource is in short supply. It is dealt with in detail by B. V. Carsberg, *op. cit.*, Ch. 3.

¹⁴This assumes that there is no interdependence between the demands for the two products.

¹⁵We could achieve the same result by calculating the contribution per unit of the scarce resource produced by the new opportunity and ranking it with existing opportunities. This method, however, becomes computationally complicated where more than one resource is scarce.

¹⁶For those not familiar with linear programming, good introductions may be found in B. V. Carsberg, *op. cit.*, Ch. 4 and W. J. Baumol, *Economic Theory and Operations Analysis*, 2nd edition (Prentice-Hall, 1965), Ch. 5.

¹⁷To avoid unnecessary computational problems we shall again assume that stock levels do not change during the year.

for z. From this we may derive the optimal production plan shown in Table 4.

| TABLE 4 | | | |
|---------|--------------------------|----------|-----------------------|
| Product | Contribution per unit | Quantity | Total contribution |
| Y | £2.5 | 2,375 | £5,937.5 |
| Z | £2.0 | 1,400 | £2,800.0 |
| | | | £8,737.5 |

In solving the linear programming problem, we determine not only the optimal production levels of Y and Z but also dual prices for each scarce resource. These are shown in Table 5. Given the type of formulation used, the dual, or shadow, price of a resource indicates by how much total contribution will fall if the available amount of that resource decreases by one (small) unit. For example, if available machine time falls by one hour the maximum total contribution attainable will decrease by 21½p. The dual price of a particular resource is a measure of the contribution a marginal unit of that resource makes to fixed costs and profits under the optimal plan.

| TABLE 5 | |
|---------------------------|----------|
| Dual price of | Per hour |
| Executive management time | £0.0875 |
| Machine time | £0.2150 |

Any opportunity under consideration which is outside the optimal plan should be accepted only if it uses scarce resources at least as efficiently as the least profitable opportunities included in the optimal plan, i.e. it should be accepted if its contribution is greater than or equal to the dual price value of the scarce resources it uses. Thus in a situation where more than one resource is scarce the relevant cost of using one (marginal) unit of a resource is the sum of its external opportunity cost and internal opportunity cost, the latter now being given by its dual price.

Relevant cost and minimum price setting

Having described a framework for estimating relevant cost we shall now consider how it might be applied to interim pricing decisions. It is convenient to distinguish two situations. The first arises when the opportunity under consideration is included in the linear programming formulation of the selection of activities for the coming year. The second occurs when some new productive possibility emerges which has not previously been considered.

Let us consider the first of these two situations. Details of the master budget may not be available to subordinates responsible for pricing decisions. But suppose that they are given the dual prices of scarce resources.¹⁸ The master budget reflects the optimal strategy open to the firm given its available resources and dual prices measure the marginal value of the resources in this optimal use.¹⁹ From this we are able to establish a *minimum price* rule; that the price charged must be at least sufficient to cover the external opportunity costs and dual price values (internal opportunity costs) of the resources to be used.

Suppose, for example, that the firm in the previous illustration delegates pricing decisions to a sales manager and tells him external opportunity costs and dual prices of input factors. What minimum price should he set for products Y and Z using the minimum price rule stated above? The calculations are shown in Table 6. It is apparent that they correspond exactly with the prices that were used when the product contributions were initially calculated (Table 1). Thus the prices set will at least accord with the optimal plan. Unfortunately, the information obtained is of little help to the sales manager in deciding how much of each of the products should be manufactured for sale; to determine this he would need to consult the master budget.

Now consider the second case, where a new product line is under consideration. We have to decide what minimum price should be charged for the new product, which we shall call product X. The external opportunity cost of producing one unit of the product is shown in Table 7. Each unit produced requires 10.0 machine hours and 20.0 hours of executive management time. Applying the minimum price rule would give a price of £12.9 as shown in Table 7. Selling a combination of products which includes X at this minimum price should lead to the same total contribution as was previously available from products Y and Z (Table 4). We can check whether this is the case by reformulating the linear programming problem to include X and re-solving it. First we must calculate the contribution from each unit of X:

¹⁸If only one resource is scarce the relevant information will be the contribution produced by the marginal production opportunity for each unit of the scarce resource it uses. This figure is merely a special case of a dual price and could also have been found by solving the one scarce resource problem as a linear program. For the remainder of this paper dual prices will be taken to include this special case.

¹⁹The dual price of a resource not representing an effective constraint on production in the optimal plan will be zero and the relevant cost of using the resource will be its external opportunity cost.

TABLE 6

| Product | Y £ | Z £ |
|---|---------------|--------------------|
| External opportunity costs per unit (Table 1) | 9.50 | 8.50000 |
| Internal opportunity costs (dual prices): | | |
| Executive management time | 0.35 (4 hrs) | 0.65625 (7.50 hrs) |
| Machine time | 2.15 (10 hrs) | 1.34375 (6.25 hrs) |
| | <u>12.00</u> | <u>10.50000</u> |

| | |
|---|------------|
| Selling price per unit | £ 12.9 |
| Less External opportunity cost per unit (Table 7) | 9.0 |
| Contribution per unit | <u>3.9</u> |

If we let x equal the amount of X to be produced and sold we may reformulate the linear programming problem as follows:

$$\text{Max. } C = 2.5y + 2.0z + 3.9x$$

$$\text{s.t. } 4.0y + 7.5z + 20.0x \leq 20,000$$

$$10.0y + 6.25z + 10.0x \leq 32,500$$

$$y, z, x \geq 0$$

TABLE 7

| Product X | £ | £ |
|-------------------------------------|----------|-------------|
| External opportunity cost per unit: | | |
| Materials | 3.50 | |
| Labour | 2.30 | |
| Machine user cost | 3.20 | |
| | <u>—</u> | 9.0 |
| Internal opportunity cost per unit: | | |
| Executive management time (20 hrs) | 1.75 | |
| Machine time (10 hrs) | 2.15 | |
| | <u>—</u> | 3.9 |
| Minimum price per unit | | <u>12.9</u> |

The various expressions may be interpreted in the same way as in the original formulation. There is, in fact, more than one optimal solution to the problem (in technical jargon the problem is 'degenerate') but only two of them are necessary to illustrate the point being made.²⁰ The first corresponds with the solution found for the original formulation – y equals 2,375 and z equals 1,400 – which leads to the production plan shown in Table 4. The second includes a positive value for x (437.5) and also for y (2,812.5) but a zero value for z . It implies the production plan shown in Table 8 yielding a total contribution, as

previously, of £8,737.5. The dual prices of the two scarce resources are the same as for the initial formulation.

TABLE 8

| Product | Contribution per unit | × Quantity | = Total contribution |
|---------|--------------------------|------------|-------------------------|
| X | £3.9 | 437.5 | £1,706.25 |
| Y | £2.5 | 2,812.5 | £7,031.25 |
| Z | £2.0 | 0.0 | £0.00 |
| | | | <u>£8,737.50</u> |

Our calculations have led us to a minimum price for the new product which at least leaves the firm no worse off than the original optimal plan. Again the dual prices alone fail to indicate what quantity of product X should be manufactured. Nor do they indicate revised production levels for the original products, Y and Z . To establish these quantities we must reformulate and re-solve the problem.

Uses of dual prices

In both situations that have been considered (the pricing of existing and new products) dual prices of scarce resources are useful in determining minimum prices. As we have noted, however, they do not indicate what quantities of available products we should aim to produce and sell. Are dual prices then of use in making interim pricing decisions? Before accepting a new production opportunity we must, strictly, re-solve our master budget to determine optimal output levels. The computational facilities of electronic computers mean that once the initial linear programming problem has been formulated such modifications are quickly and easily accommodated. However, computer time is not free, and to deal with every new opportunity in this way may prove expensive. The use of dual prices as a screening device may enable us to avoid the expense of re-calculating the optimal plan in order to assess the impact of every new opportunity. If the minimum price calculated by adding external and internal opportunity costs is clearly unattainable then we

²⁰Degeneracy is inevitable given the nature of the problem – to determine the lowest price at which the new product can be sold without reducing the profit attainable from the optimal plan. The minimum price should result in a new plan having the same total profit as the original one. There must be at least two optimal solutions and hence degeneracy.

need not waste time re-running the master budget. No feasible price for the new opportunity would result in an increase in the net present worth of the organisation. If the minimum price calculated is, on the other hand, thought to be attainable then the product is at least worthy of further consideration.

Dual prices may also be useful when the opportunity being considered represents only a small part of the total operations of the organisation. Strictly we still need to reformulate and re-solve the program; in practice this may not be necessary because the constraints assumed in the original formulation are unlikely to be rigid. A simple example may make this clearer. Let us reconsider our original firm manufacturing only products Y and Z according to the production plan shown in Table 4. A new opportunity, in the form of a 'one-off' job, W, is presented for consideration.²¹ It will last for one year and will require 200 machine hours and 80 hours of executive management time. The minimum price calculation is shown in Table 9. The contribution from the job for inclusion in the revised linear program is:

| | |
|--|-------|
| | £ |
| Selling price | 235.0 |
| Less External opportunity cost (Table 9) | 185.0 |
| Contribution | 50.0 |

If we let w equal the number of times job W is to be undertaken (where w must be less than or equal to one) we may reformulate the linear programming problem as follows:

$$\begin{aligned} \text{Max. } C &= 2.5y + 2.0z + 50.0w \\ \text{s.t. } 4.0y + 7.5z + 80.0w &\leq 20,000 \\ 10.0y + 6.25z + 200.0w &\leq 32,500 \\ w &\leq 1 \\ y, z, w &\geq 0 \end{aligned}$$

²¹This is not to suggest that, in general, 'one-off' jobs may be regarded as insignificant and product lines as significant. The Ferranti Bloodhound Missile contracts (J. F. Flower, op. cit.) provide good examples of 'one-off' jobs which are clearly not insignificant.

TABLE 9

| Job W | £ | £ |
|------------------------------------|------|-------|
| External opportunity cost: | | |
| Materials | 40.0 | |
| Labour | 81.0 | |
| Machine user cost | 64.0 | |
| | — | 185.0 |
| Internal opportunity cost: | | |
| Executive management time (80 hrs) | 7.0 | |
| Machine time (200 hrs) | 43.0 | |
| | — | 50.0 |
| Minimum price | | 235.0 |

The only new expression introduced is the constraint $w \leq 1$ which takes account of the fact that W is a 'one-off' job. As was the case when the new product X was introduced the problem is degenerate. We shall again consider only two possible solutions. The first, leading to the production plan in Table 4, has been discussed previously. The second gives values for y of 2,355, for z of 1,400 and for w of 1. This leads to the production plan shown in Table 10 which yields the same total contribution as the original optimal plan. But suppose management had decided not to re-run the linear program for small projects and that job W was regarded as a small project for this purpose. According to our minimum price calculation job W is marginally worthwhile at a price of £235.0. Its acceptance without a reduction in the quantities produced of Y or Z would imply a production level and a usage of scarce resources as shown in Table 11.

TABLE 10

| Product | Contribution per unit | × | Quantity | = contribution | Total |
|---------|-----------------------|---|----------|----------------|----------|
| W | £50.0 | | 1.0 | | £50.0 |
| Y | £2.5 | | 2,355.0 | | £5,887.5 |
| Z | £2.0 | | 1,400.0 | | £2,800.0 |
| | | | | | £8,737.5 |

TABLE 11

| Product | Quantity | Scarce resources required | |
|---------|----------|-----------------------------------|----------------------|
| | | Executive management time (hours) | Machine time (hours) |
| W | 1 | 80 | 200 |
| Y | 2,375 | 9,500 | 23,750 |
| Z | 1,400 | 10,500 | 8,750 |
| | | 20,080 | 32,700 |

There are two possible remedies, one of which will have to be available if the argument in favour of not re-running the linear program for small projects is to hold. First, the firm may be able to stretch its available resources to meet minor changes such as these. It might somehow find an extra 80 hours of executive management time and an additional 200 machine hours. If it is able to do this it should achieve the production quantities shown in Table 11. However this implies that the original plan for producing only Y and Z could have been improved.

The second possible remedy is to approximate the amount by which production of Y and Z should change to accommodate the new job. It may be

possible to obtain a rough idea of how to adjust output by considering relative uses of scarce resources. In the example given job W uses more machine time than executive management hours relative to the amounts available. Of the two products being manufactured Y uses more machine time per hour of executive management time than does Z. As a crude approximation we might decide to cut back production of Y to accommodate job W. W requires 200 machine hours and 80 hours of executive management time and each unit of Y requires 10 machine hours and 4 hours of executive management time. Production of Y must be cut back by the higher of $\frac{200}{10}$ and $\frac{80}{4}$ units. In this case both have the same value, 20 units. A reduction of 20 units in the production of Y leads to the desired production plan shown in Table 10. This method of approximation will not be so effective in more complex situations; however, the errors that it implies may be swamped by errors resulting from the uncertainty of predictions.

Optimal price setting

Most of what has been said so far has related to the establishment of a minimum price. If budgeted volume is achieved at this price then at least the firm should attain budgeted profit consistent with the maximum net present worth which the firm thought it could achieve at the time the budget was set. This is sufficient to satisfy the main objective of this paper; the establishment of a systematic framework for pricing new products in a way that will not reduce planned profit. Any interim prices which are implemented will automatically be reviewed at the next (annual) planning point.

However we have assumed a goal of profit maximisation and it may be that the firm is able to increase its profit further by charging more than the minimum price. If interim pricing decisions are to be optimal the firm has to take into account market demand conditions. Study of this further stage is outside the scope of this paper and is covered in basic texts on economics and marketing. We restrict ourselves to noting that it may involve finding some use for the conventional cost-plus formula. The cost-plus formula may give some indication of the prices competitors are likely to submit – for example, to a firm which is tendering for a contract. Such a use will hold only if competitors use cost-plus pricing techniques with mark-ups corresponding to those of the firm and if the cost-volume relationships of the competitors are similar to those of the firm. The difficulty in using this method is in estimating the extent to which competitors may be ‘shading’ cost-

plus prices to meet market conditions.

Limitations of the suggested framework

There are a number of limitations to the method outlined above which must be borne in mind when an attempt is made to apply it.

The master budget, which is assumed to reflect the optimal strategy available to the firm, is of central importance in providing information about the internal opportunity costs of the various scarce resources used in production. But by nature it is ephemeral; it will almost immediately be out of date. The information may be misleading if the budget is not revised frequently to incorporate new projects and also changes in the environment in which the firm operates.

Another limitation stems from the assumptions of linear relationships needed for the application of a linear programming formulation. It may be inappropriate, for example, to assume that each unit of output of a particular product requires a constant amount of each input factor.²²

Calculations for decision purposes are bound to neglect some items that cannot easily be quantified – linear programming is no exception. For example, there may be a possibility of industrial action if the plan implied by the linear programming solution is applied rigidly and includes the provision that labour should be laid off.

Furthermore, dual prices are constant only for ‘small’ changes in an optimal plan. The dual price of a resource gives an estimate of how much total contribution will rise if we expand the availability of that resource by one (small) unit. It does not necessarily follow that total contribution will rise by, say, 100 times the dual price if we obtain an extra 100 units of the resource.

We have already discussed the possibility that the constraints included in the formulation of the linear program may not be rigid.

Finally, we have assumed so far that there are no interdependences between the demands for the various products under consideration – for example, that the elimination of one product will not affect the demand for others. In practice it is likely that certain of the goods manufactured by an organisation will be complements of or substitutes for other goods produced by the same firm. Strictly, if a mathematical programming approach to product selection is to be adopted, something more than the relatively simple

²²For a fuller treatment of the linearity assumptions see B. V. Carsberg, *op. cit.*, pp. 104–105.

linear programming models discussed so far may be required.²³

Conclusion

An attempt has been made to develop a systematic framework for assisting firms in tackling the problem of interim pricing decisions. It was suggested that the first stage in setting a price should be the determination of a minimum price, based on the concept of opportunity cost. To do this we made use of linear programming and, in particular, of dual prices. Examples were given to illustrate the usefulness and the limitations of dual prices; that they provide us with valuable information for determining minimum prices for new production opportunities but do not indicate the precise changes in output levels consequent on their adoption. The most useful application of dual prices seemed to be to assist management in

screening new opportunities so that it was unnecessary to re-run the linear program when a production possibility was clearly unprofitable or when its impact on the total operations was so small that an approximation of the required changes in the plan was sufficient. The setting of minimum interim prices in this way should, provided budgeted volume is achieved, at least lead to the attainment of budgeted profit. Adjustments to this minimum price to reflect market conditions were then briefly mentioned.

It is clear that much research needs to be done in this area. One possibility may be in the direction of interim pricing decisions where there are interdependencies between the demands for the various products manufactured by a firm. It is hoped that this paper might provide the basis for such further research.

Acknowledgement

I am indebted to Professor Bryan Carsberg for his many valuable comments on this paper.

²³For an introduction to non-linear programming see W. J. Baumol, *op. cit.*, Ch. 7.

What is Capital Gearing?

Peter Bird

It is surely a sign of the immaturity of finance as an academic discipline that there is no generally accepted definition or measurement formula for capital gearing (financial leverage). When engineers talk about gearing or leverage they all know what these terms mean and how to measure and communicate the degree of their presence. In financial reporting there is a school of thought which holds that diversity indicates the presence of lively intellectual activity, while uniformity of definition and practice discourages and hinders the exercise of professional judgement and slows down the improvement of standards. In my opinion the balance of factors is in favour of uniformity in financial reporting; but it is much more clearly and heavily in favour of uniformity in the context of financial analysis of topics such as corporate financial structure.

There are two quite distinct reasons for seeking standardised usage in such contexts. First, if a concept does not have a single recognised meaning and measure, discussion becomes at best laborious, at worst confused and misleading. The term cannot be used as a known 'codeword', but needs to be explained at length. If such explanations are not included, there may be in the ensuing discussion no genuine meeting of minds at all. Secondly, acceptance of an array of alternative definitions and measures will tend to reduce the incentive to seek the "best" alternative. Such a search may show that different definitions are most appropriate to various situations; what is thought "best" at one time may be superseded by some other measure in the light of later analysis; but the quest for the optimum will improve the rigour and clarity of thinking about the topic.

I shall support the first of these general assertions by showing the effect that confusion about capital gearing has had on the exposition of the "arbitrage proof" of Modigliani and Miller's Proposition I¹:

¹F. Modigliani and M. H. Miller, "The Cost of Capital, Corporation Finance, and the Theory of Investment", *American Economic Review*, June 1958, and in S. Archer and C. A. D'Ambrosio, *The Theory of Business Finance*, Collier-Macmillan, 1967, page 132 (page references to Archer and D'Ambrosio).

"the market value of any firm is independent of its capital structure and is given by capitalising its expected return at the rate P_k appropriate to its class". This example is chosen not so much for any inherent importance it may have, but because it has seemed to me to be (whatever one's view of the reality of its assumptions or the empirical support for it) a model of the sort of rigour to which we should all be aspiring in financial analysis, and because it has been expounded and criticised by so many other writers in a fairly short period.

All writers seem to agree that a firm is said to be 'geared' or 'levered' if some of its capital is entitled to a fixed periodic payment in priority to any payment to the equity shareholders, and 'ungeared' or 'unlevered' if all of its capital is provided on equity terms. It is also generally recognised that the variability of income attributable to equity shareholders in a geared company is greater than that of their income in an ungeared company with the same operating results.

Modigliani and Miller (MM henceforth) sought to show that whenever the market value of a geared and an ungeared company, otherwise identical, was not the same (as their Proposition I asserted it would be), investors could, by engaging in "arbitrage" which would bring the market values into equality, increase their income while keeping the same level of gearing as before. The last condition is vital to the original MM proof since individual share-holders may take widely differing views of the quality of equity income subject to various levels of gearing.

And so 'gearing' must be measured. MM do not explicitly state how they measure gearing, but their definition of it is entirely clear and is consistently used in their original exposition. They measure gearing as the proportion of the market value of the total capital (of a firm or an investor) which is provided on fixed terms as opposed to equity terms. They then show that an investor owning the fraction α of the shares of a geared company "2" which has shares of total market value S_2 and debt capital of total market value D_2 ($S_2 + D_2 = V_2$), can sell his shares for S_2 , borrow αD_2 and invest these two sums in an other-

wise identical ungeared company "1", whose total market value of shares is $S_1 = V_1$. He now has income of "equivalent leverage" of $Y_1 = \alpha \frac{V_2}{V_1} X - r \alpha D_2$

instead of $Y_2 = \alpha X - r \alpha D_2$ where X = operating income of each company before interest, r = the rate of interest on debt. As long as $V_2 > V_1$ the investor can increase the amount of income of "equivalent leverage" by making the switch of investments from firm "2" to firm "1".

But Y_1 is only of "equivalent leverage" to Y_2 if the measure of gearing used by MM is accepted as the only or the most sensible measure to apply in such a situation. A review of the secondary sources, where writers have attempted to explain MM's proof, often with arithmetic examples to supplement MM's algebra, is enough to show that this cannot be taken for granted.

Durand,² in a comment on MM's article, gives a numerical example of switching from the geared Closecorp to the ungeared Petrolease, and borrowing on personal account to restore the investor's gearing to the previous level. Because half of Closecorp's operating income is absorbed by debt interest, he recommends borrowing an amount such that debt interest will absorb half the income from Petrolease shares purchased with the proceeds of Closecorp shares and the borrowed funds. This gives increased income "with no loss of stability: . . . the investor assures himself that his net income will exhibit exactly the same percentage fluctuations as Closecorp dividends."³ He recommends borrowing \$34,000, but MM's αD_2 is \$30,000. It will be shown that there are only two major classes of measure of gearing, and that Durand's measure comes from the class not adopted by MM. Yet Durand does not appear to have been taken to task for this by MM in their reply to his comments.

Merrett and Sykes measure gearing as the "ratio of debt to debt plus equity at current market values"⁴ when they are discussing the "traditional" view of a U-shaped weighted average cost of capital as "gearing" is increased. This is another way of stating the measure used by MM in their proof. But when Merrett and Sykes set out a numerical example of MM arbitrage⁵ they do not use the measure agreed

upon by themselves and MM. The investor holds 1,000 shares in Geared Ltd. (G. Ltd.), until he switches to Ungeared Ltd. (U. Ltd.). Both have annual incomes before interest of £100,000 and their market values are:

| | | |
|---------------|--------------------------------------|------------------|
| Geared Ltd. | 800,000 £1 shares at £1.10 | 880,000 |
| | 200,000 £1 6% debentures at £1.00 | 200,000 |
| | | <u>1,080,000</u> |
| Ungeared Ltd. | 1,000,000 £1 shares shares at £1 | <u>1,000,000</u> |

The investor sells his 1,000 shares in G. for £1,100, borrows £275 and invests £1,375 in U. Ltd. Merrett and Sykes do not say how they arrived at the figure of

£275. It is certainly not αD_2 which is $\frac{1,000}{800,000}$

x 200,000 i.e. £250. Unfortunately £275 could be reached from two plausible calculations. They could be following Durand; as debt interest in G. Ltd. absorbed 12% of its income (6% of £200,000 out of income of £100,000) then debt interest on personal borrowing should absorb 12% of income from investment in U. Ltd. At £275 borrowing this is achieved; income from U Ltd., is

$\frac{1,375}{1,000,000} \times 100,000 = £137.50$, and debt interest is

6% of £275 = £16.50. But the statement that "MM assume investors to be able to borrow identical proportions to firms at identical interest rates"⁶ seems to point rather towards the other possible basis for £275 borrowing. The ratio £1,100 equity: £275 borrowing is the same as the ratio of the *book* amounts of equity and debt in G. Ltd.

Quirin⁷ gives yet another illustration, which has little connection with the original proof it purports to be expounding. An investor owns 1/500 of the shares in a geared company (B), and so "he must bear 1/500 of the risk of fluctuation in B's income". When he switches he borrows personally enough to enable him to buy 1/500 of the shares in the ungeared company (A) "so that his risk would be unchanged". In MM terminology he borrows $(\alpha S_1 - \alpha S_2)$ and switches from holding αS_2 to holding αS_1 . In fact this example shows not only an increase in income after the switch from \$1,400 to \$1,520, but a fall in gearing measured in capital terms $\left(\frac{D}{V}\right)$ from 45% to

²D. Durand, "The Cost of Capital, Corporation Finance and the Theory of Investment: Comment", American Economic Review, September 1959, and in S. Archer and C. A. D'Ambrosio, op. cit., pages 160-176.

³Ibid, page 164.

⁴A. J. Merrett and A. Sykes, The Finance and Analysis of Capital Projects, Longmans, 1963, page 396.

⁵Ibid, pages 413-416.

⁶Ibid, page 415.

⁷G. D. Quirin, The Capital Expenditure Decision, Irwin, 1967, pages 127-9.

40% and in income terms ($\frac{rD}{X}$) from 30% to 24%.

And so the full power of this demonstration is not brought out in Quirin's text where he insists that the investor's risk is unchanged by the switch.

Quirin seems to have anticipated Heins and Sprenkle⁸ who set out algebraically the same proof as answer to an objection raised to the original MM proof that, where Y_1 is greater than Y_2 , the variance of Y_1 is greater than the variance of Y_2 . Replying to Heins and Sprenkle, MM⁹ accept the new proof, but not the objection it was designed to overcome. Since the variance of X is the same in both firms by definition, higher returns can be obtained from investment in the lower valued firm whatever admissible value is taken by the random variable X .

MM do not mention the term "leverage" in this reply or in connection with a further alternative proof set out in the same article, which they claim to be easier to understand and more general than either of the previous ones. This proceeds as before to the selling of geared equity for αS_2 and the borrowing of αD_2 . But instead of showing that income is increased if the whole of $\alpha S_2 + \alpha D_2 = \alpha V_2$ is invested in shares of company "1" where $V_2 > V_1$, they show that, by purchasing $\alpha S_1 = \alpha V_1$ of the ungeared equity the investor can obtain "the identical (random) outcome for a smaller net investment". Income will still be $\alpha X - \alpha rD_2$ as before the switch and the investor will have spare cash of $\alpha(V_2 - V_1)$.

In Van Horne's numerical example of this proof¹⁰ the market values of the two companies are:

| | | |
|---|----------------------|------------------|
| A | Shares | \$100,000 |
| B | Shares | \$77,272 |
| | 5% loan stock at 100 | 30,000 |
| | | <u>\$107,272</u> |

The income before interest of both companies is \$10,000. An investor holds 1% of the shares of B (i.e. αS_B). He sells these for \$772.72 and borrows $\alpha D_B = 1\%$ of \$30,000 = \$300. As usual the basis for the amount of borrowing is not explicitly stated. It gives the investor the same proportions of debt and equity in his funds as he held previously through the geared company; but it also retains the same absolute amount

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of prior charge deductions from his share of gross income and the latter seems more relevant to the proof. But he then buys αS_A for \$1,000 to produce the same income pattern as his investment in company B - \$100 of income before interest payments, \$15 of interest payments, \$85 of income for the investor. He has \$72.72 surplus cash at the end of these deals; he has the same degree of gearing using calculations of percentage of gross income absorbed by interest payments. But he does *not* have the same degree of gearing of his investment based on the capital measure used to calculate the amount to be borrowed. Before

the switch, $\frac{D}{V}$ for his investment was $\frac{300}{1072.72} = 28\%$.

but afterwards it was $\frac{300}{1,000} = 30\%$. If the \$72.72

surplus is regarded as earmarked for ungeared investment of equivalent risk it can be included in V and so the market value measure of gearing is unchanged; but the generality of this proof demands that "it requires no assumption as to how the saving achieved by switching portfolios is to be invested (or, indeed, as to whether it be invested at all)."

Robichek and Myers¹¹ expound MM's original proof correctly; in the circumstances this seems worthy of being put on record.

The second general assertion at the beginning of this paper was that the search for a "best" definition and measure of gearing should be encouraged and that we should not be content with the present diversity of usage, even if it did not produce the sort of confusion which has been shown to exist. What then are the alternative measures of leverage and what are the choices to be made?

Two uses of the term 'leverage' in a financial context should be noted, but they seem to be separable from the present topic of capital gearing and can be omitted from subsequent discussion. "Operating leverage" has been used to describe the relationship between the percentage change in profit and the percentage change in volume; in the presence of fixed costs this is greater than unity, as illustrated by break-even analysis and charts.¹² And in public finance the term "fiscal leverage" reflects the fact that an increase in government expenditure tends to be more expansionary than an equal increase in net government receipts is restrictive.¹³ The mechanical metaphor

⁸A. J. Heins and C. M. Sprenkle, "A Comment on the Modigliani - Miller Cost of Capital Thesis", *American Economic Review*, 59, September 1969, pages 590-592.

⁹F. Modigliani and M. H. Miller, "Reply to Heins and Sprenkle", *American Economic Review*, 59, September 1969, pages 592-595.

¹⁰J. C. Van Horne, *Financial Management and Policy*, 2nd edition, Prentice Hall 1971, pages 212-214.

¹¹A. A. Robichek and S. C. Myers, *Optimal Financing Decisions*, Prentice Hall, 1965, pages 21 and 24-25.

¹²J. C. Van Horne, *op. cit.*, pages 679-687.

¹³R. A. and P. B. Musgrave, "Fiscal Policy", in R. Caves and Associates, "Britain's Economic Prospects", *Brookings/Allen and Unwin*, 1968, pages 40-42 and Appendix Section IV.

seems of doubtful validity in this latter usage.

There is general agreement that capital gearing or financial leverage is measured by relating characteristics of prior charges and of the equity interest. There are three points of decision in converting this agreed base into an operational measure:

- (a) What is included in prior charges?
- (b) What characteristics of the equity interest and of the priority sources of finance are to be compared?
- (c) What particular arithmetic form should the presentation of the comparison take?

Westwick asserts¹⁴ that "the general rule followed by writers is to limit their definition of 'prior charges' to preference shares and debentures" and advocates instead inclusion of all liabilities including trade creditors and contractual obligations under leases and rental agreements. Archer and D'Ambrosio¹⁵ and Marris¹⁶ adopt this basis at least as far as balance sheet items are concerned. Midgeley and Burns¹⁷ include overdrafts in their prior charges. The statement of Van Horne that "leverage may be defined as the employment of an asset or funds for which the firm pays a fixed cost or fixed return"¹⁸ also implies this all-inclusive coverage. Only Westwick identifies the corresponding income effects that should also be taken into account.¹⁹ It is necessary to agree upon a definition of prior charges or debt capital if we are to attain standardisation of practice. But it is not necessary in order to avoid confusion in the proof of MM's Proposition I; their debt can be represented by a symbol or a number without precise agreement on the items included in it.

There are three main alternatives for characteristics of debt and equity to be compared in a measure of gearing:

- (i) capital amounts at book values
- (ii) capital amounts at market values
- (iii) division of income before interest payments.

The first of these is clearly the least supported by the basic economic analysis of the situation. Its great advantage is that it is more accessible than the market value of capital and changes less often. A version of it was used by Prussmann and Murphy in their survey

of 'Gearing in British Quoted Companies';²⁰ they note that the definitions used were mostly inherent in the SCAN Investment Analysis System they used for the retrieval of the data they analysed. Buckley also used this definition and noted that he did not agree with its exclusion of short-term debt but that "the definition . . . was chosen to conform with available statistics for industrial companies in general",²¹ particularly those of Prussmann and Murphy.

MM used Alternative (ii), capital amounts at market values, in their original proof without explicitly stating this. In their 1969 proof they slide into Alternative (iii) towards the end though they avoid leverage terminology there. Although there is some evidence of high correlation between these two measures in practice, they are not equivalent and may produce different rankings of gearing. We cannot begin to determine which of the two is more suitable, in the MM context or in more general use, until we have considered why measures of gearing are of any use or significance. Choice of the arithmetic form of the chosen measure tends to follow naturally from the use envisaged. Some of the confusion about gearing measures arises from the many transformations of formulae that have been used to produce completely different numbers for what are essentially the same measure. Any capital measure can be expressed as $\frac{D}{S}$ or $\frac{D}{S+D}$ or $\frac{S}{S+D}$ or the inverse of any of these.

Income measures can be written as $\frac{X}{rD}$ (times interest covered) or $\frac{X}{X-rD}$ or $\frac{rD}{X-rD}$ or the inverse of any of

these. It will be seen that the use of a measure needs to be established first; then its form as well as its basis are determined so that it can be used as a multiplier or transformation factor relative to the characteristics being compared.

Pearson Hunt²² identifies two "approaches to the phenomenon" which call for separate, though closely related, measures. He makes the wise suggestion that we give the two measures different names. He follows Kohler²³ in using the term "trading on the equity" for the factor by which the rate of return on total

¹⁴C. A. Westwick, "Towards a New Measure and Use of Gearing", *Accounting and Business Research*, 1, Winter 1970, page 18.

¹⁵S. Archer and C. A. D'Ambrosio, *Business Finance: Theory and Management*, Collier-Macmillan, 1966, page 512.

¹⁶R. Marris, *The Economic Theory of Managerial Capitalism*, Macmillan, 1964.

¹⁷K. Midgeley and R. G. Burns, *Business Finance and the Capital Market*, Macmillan, 1969, pages 59-60.

¹⁸J. C. Van Horne, *op. cit.*, page 679.

¹⁹*Op. cit.*, page 20.

²⁰D. Prussmann and G. Murphy, "Gearing in British Quoted Companies", *Business Ratios*, Vol 2, No. 3, Winter 1968.

²¹A. Buckley, "A Profile of Industrial Acquisitions in 1971", *Accounting and Business Research* 8, Autumn 1972, page 250.

²²Pearson Hunt, "A proposal for Precise Definitions of 'Trading on the Equity' and 'Leverage'", *Journal of Finance* September, 1961, page 377.

²³E. L. Kohler, "A Dictionary for Accountants", Prentice Hall, 1952, pages 427 and 254.

capital is multiplied to give the rate of return on equity capital. In MM symbols "trading on the equity"

$$(TE) = \frac{X-rD}{S} \cdot \frac{V}{X} \cdot \frac{24}{X} \text{ This could be called a mixed}$$

capital and income measure, and Hunt sees it as taking the viewpoint of management seeking "to determine the desired proportion of debt to equity in the corporation".

He also follows Kohler's definition of "leverage" as the factor by which a percentage change from present levels of income before payments for prior charges has to be multiplied to give the consequent percentage change in equity income. In MM terminology

$$\text{leverage (L)} = \frac{X-rD}{X} \cdot \frac{25}{25} \text{ Rix gives this income}$$

measure the appropriate title of "revenue gearing multiplier".²⁶ Hunt sees this measure as taking the investment analyst's viewpoint, as he considers the consequences to equity of varying levels of income before charges. This may well be the viewpoint of the switching investor in MM's proof.

I am inclined to retain my previous view²⁷ that a pure capital measure of gearing is only of significance in the face of a real prospect of liquidation. Within a firm this will be a relatively rare situation, but the condition is not as restrictive as it sounds. A creditor - long-term or current trading - will only face a risk situation if the firm indebted to him is unable to meet its obligations and so faces insolvency. In this situation however market and book values of loan and equity capital are equally inappropriate; the relevant figures are the liquidation values of the assets and of any claims ranking ahead of the creditor whose interests are being considered.

But market values of capital are relevant to those many equity investors who seek their gain wholly or partly from rises in capital values rather than from their share of equity income. The extremes of this are holdings of the capital shares of split trusts and holdings of share warrants. The latter may be regarded as a form of investor gearing, since the investor in warrants buys the rights to the gain in the market value of more initial investment than his original

²⁴X. $TE = \frac{X-rD}{S} \therefore TE = \frac{X-rD}{S} \cdot \frac{V}{X}$ Where there are no

prior charges. $S=V$ and $D=0$, hence $TE=1$.

²⁵dX. $L = \frac{d(X-rD)}{X-rD} \therefore L = \frac{d(X-rD)}{X-rD} \cdot \frac{X}{dX}$ As rD is fixed, then $L = \frac{dX}{X-rD} \cdot \frac{X}{dX} = \frac{X}{X-rD}$.

²⁶M. S. Rix, *Investment Arithmetic*, 3rd Edition, Pitman, 1971, page 234.

²⁷Peter Bird, *The Interpretation of Published Accounts*, H.M.S.O., 1971, page 14.

capital. If warrants to purchase for £1.00 shares now quoted at £1.00 cost 25p, an investor with £1,000 capital who can only purchase 1,000 shares can, instead, purchase 4,000 warrants. Since no income is received by the warrant-holder unless and until he exercises his warrant, no income-based measure of gearing is meaningful or possible. Kennedy²⁸ defines the gearing ratio of warrants as "the ratio of the initial price of the ordinary to the cost of the warrant", corresponding to his measure of gearing by borrowing which is $\frac{V}{S}$ in MM terminology. Thus in the example

above the gearing ratio is $\frac{1.00}{0.25} = 4$, since the investor can buy four times as many warrants as shares.

But there are also investors in the market who are interested in the equity income stream and the financial risks attaching to it. These income oriented investors are likely to view two investments as having "equivalent leverage" if the values of some such measure of their holding as $\frac{X}{X-rD}$ were equal. It is

relevant to ask whether the arbitrage process would operate in this circumstance, despite the fact that this entails ascribing a numerical value to X whereas MM treat it as a random variable.

In the original proof given by MM (Archer and D'Ambrosio p.133), the amount to be borrowed is determined so as to equate $\frac{D}{S}$ or rD before and after

the switch, and then the income after the switch is shown to differ from that before the switch except where $V_1 = V_2$. The amount to be borrowed is now recalculated on the assumption that the aim is to

equate the investor's $\frac{X}{X-rD}$ before and after the switch. The amount to be borrowed on personal account (D_p) must now be such that

$$\frac{\alpha S_2 + D_{p_x}}{S_1} = \frac{X}{X-rD_2}$$

(subscript₁ refers to the ungeared firm and subscript₂ to the geared firm).

$$\text{Thus: } D_p = \alpha D_2 \frac{S_2}{S_1 - D_2} = \alpha D_2 \frac{V_2 - D_2}{V_1 - D_2}$$

When $V_1 = V_2$, but not otherwise, $\frac{V_2 - D_2}{V_1 - D_2} = 1$ and

²⁸Charles Kennedy, "Two Types of Gearing", unpublished discussion paper, University of Kent at Canterbury, 1972.

$D_p = \alpha D_2$ as used by MM²⁹.

The income from investing $(\alpha S_2 + D_p)$ in the ungeared company and paying interest on D_p out of the dividends is

$$\begin{aligned} Y_1 &= \left[\frac{\alpha S_2 + \alpha D_2 \left(\frac{V_2 - D_2}{V_1 - D_2} \right)}{S_1} \right] X \\ &\quad - r \alpha D_2 \left(\frac{V_2 - D_2}{V_1 - D_2} \right) \\ &= \alpha X \left[\frac{S_2 + \frac{D_2}{S_1}}{S_1} \left(\frac{V_2 - D_2}{V_1 - D_2} \right) \right] \\ &\quad - r \alpha D_2 \left(\frac{V_2 - D_2}{V_1 - D_2} \right) \end{aligned}$$

This will equal the income from the geared company

before switching:

$$Y_2 = \alpha X - r \alpha D_2$$

if and only if the expressions in brackets take the value

1. This is true of $\frac{V_2 - D_2}{V_1 - D_2}$ only when $V_1 = V_2$, and in

that circumstance $\frac{S_2 + D_2}{S_1}$ will also be unity. If

$V_2 > V_1$, then $\frac{V_2 - D_2}{V_1 - D_2} > 1$, and the expression in

square brackets, which can be written as $\frac{V_2 - D_2}{V_1} +$

$\frac{D_2}{V_1} \left(\frac{V_2 - D_2}{V_1 - D_2} \right)$ is also greater than unity.

Therefore when $V_2 > V_1$ then $Y_1 > Y_2$ and switching from firm 2 to investment of "equivalent leverage" in firm 1 is beneficial. MM Proposition I can still be 'proved' when an income definition of gearing is adopted, though the proof does not give the intellectual satisfaction provided by the clarity and simplicity of the original MM version.

What is the moral of all this? Apart from a warning to beware of secondary sources, it is that we need to consider whether we are content to have everyone act like Humpty Dumpty who said "When I use a word it means just what I choose it to mean - neither more nor less".³⁰ The question is, as Alice pointed out, whether you can make words mean so many different things.

²⁹ $\frac{\alpha S_2 X + D_p X}{\alpha S_2 X + D_p X - r D_p S_1} = \frac{X}{X - r D_2}$
 $\therefore X(\alpha S_2 X + D_p X) - r D_2 X(\alpha S_2 + D_p)$
 $= X(\alpha S_2 X + D_p X - r D_p S_1)$
 $\therefore \alpha S_2 X + D_p X - r D_2(\alpha S_2 + D_p)$
 $= \alpha S_2 X + D_p X - r D_p S_1$
 $\therefore D_2(\alpha S_2 + D_p) = D_p S_1$
 $\therefore D_2 \alpha S_2 = D_p S_1 - D_p D_2$
 $\therefore \frac{D_2 \alpha S_2}{S_1 - D_2} = D_p$

³⁰ Lewis Carroll, *Through the Looking Glass*, Chapter VI.

Depreciation and Rates of Return

F. B. Pizzala

In 1965 G. C. Harcourt¹ showed that conventional or accounting rates of return bore little relationship to the actual return an asset was obtaining. Unfortunately, it appears that even now it is not generally recognized just how unreliable conventional rates of return are. Perhaps one reason for this is that Harcourt's article is not particularly easy to follow, in spite of the basic simplicity of its ideas. Nor did he use relationships that could be taken as fairly representative for the economy as a whole. This note shows some very simple relationships in order to illustrate the points made by Harcourt. However, this note is more than expository in nature because as well as showing that conventional rates of return in general bear no relationship to actual returns, the note explicitly shows why this is so by comparing arbitrary methods of depreciation – straight line and declining balance – with an economically valid method of depreciation. Hopefully, this may allow analysts to make more useful interpretations of accounts than might otherwise be possible. The note also briefly shows the impact of long construction periods. At the same time the general nature of the assumptions used are meant to bear a reasonable relationship to those that obtain in the economy. The results and analysis are then used to assess a previous conclusion by the author² that real rates of return in the companies' sector fell from about 10% in real terms in the late 1950s to about 6% in real terms by 1970.

The basic relationships:

Table 1 shows the relationships for profits, depreciation and capital stock under conditions of steady growth, and assuming a four-year plant life. These relations can be immediately generalised for assets

having a life of n years. The first set of figures shows the total gross capital stock assuming a growth rate of $(g-1) \times 100\%$ a year in gross investment. The investment is assumed completed on the last day of the year and hence in the balance sheet at the 31st of December. By year 3 the gross capital stock is in its equilibrium growth state. For year $t \geq 3$ the value of the gross capital stock is as shown in Table 1.

$$g^{t-3} + g^{t-2} + g^{t-1} + g^t$$

Generalising to assets with a life of n years the result for year t is, for $t \geq n-1$:

$$g^t + g^{t-1} + \dots + g^{t-(n-1)} \dots \dots \dots (1)$$

Similarly the equilibrium relationships for profits and annual depreciation charges respectively in year t are, for $t \geq n$:

$$\pi_1 g^{t-1} + \pi_2 g^{t-2} + \dots + \pi_n g^{t-n} \dots \dots \dots (2)$$

$$d_1 g^{t-1} + d_2 g^{t-2} + \dots + d_n g^{t-n} \dots \dots \dots (3)$$

where $\pi_1, \pi_2, \dots, \pi_n$ are the annual profits from the investment of a unit of capital in year 0, and d_1, d_2, \dots, d_n are the annual historic cost depreciation charges for the unit of investment in year 0.

The cumulative depreciation charges in year 5, for example, are the horizontal sum of the annual depreciation charges for investments 2 to 5. For the system shown in Table 1 the cumulative depreciation charges in year t are, ($t \geq 4$):

$$\begin{aligned} & (d_1 + d_2 + d_3 + d_4) g^{t-4} \\ & + (d_1 + d_2 + d_3) g^{t-3} \\ & + (d_1 + d_2) g^{t-2} \\ & + (d_1) g^{t-1} \end{aligned}$$

On generalising to assets with a life of n years the relationship is, (for $t \geq n$):

$$\begin{aligned} & (d_1 + d_2 + \dots + d_n) g^{t-n} \\ & + (d_1 + d_2 + \dots + d_{n-1}) g^{t-(n-1)} \\ & \dots \dots \dots \\ & + (d_1 + d_2) g^{t-2} \\ & + (d_1) g^{t-1} \end{aligned} \dots \dots \dots (4)$$

¹G. C. Harcourt, 'The Accountant in a Golden Age', 'Oxford Economic Papers', 1965.

²F. B. Pizzala, 'The Cost of Capital to the Private Sector: A Critique of Merrett and Sykes', 'Moorgate and Wall Street', Spring 1972.

TABLE 1
Derivation of Stable State Conventional Rates of Return

| | Year | | | | | | | |
|-----------------------------------|------|---------|--------------------|------------------------------------|--|---------------------------------------|-----------------|-----------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Gross Capital Stock: | | | | | | | | |
| Investment 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Investment 2 | | 1g | 1g | 1g | 1g | 0 | 0 | 0 |
| Investment 3 | | | 1g ² | 1g ² | 1g ² | 1g ² | 0 | 0 |
| Investment 4 | | | | 1g ³ | 1g ³ | 1g ³ | 1g ³ | 0 |
| Investment 5 | | | | | 1g ⁴ | 1g ⁴ | 1g ⁴ | 1g ⁴ |
| Total Gross Capital Stock | 1 | 1+g | 1+g+g ² | 1+g+g ² +g ³ | g+g ² +g ³ +g ⁴ | etc | etc | etc |
| Profits: | | | | | | | | |
| Investment 1 | | π_1 | π_2 | π_3 | π_4 | 0 | 0 | 0 |
| Investment 2 | | | π_1g | π_2g | π_3g | π_4g | 0 | 0 |
| Investment 3 | | | | π_1g^2 | π_2g^2 | π_3g^2 | π_4g^2 | 0 |
| Investment 4 | | | | | π_1g^3 | π_2g^3 | π_3g^3 | π_4g^3 |
| Investment 5 | | | | | | π_1g^4 | π_2g^4 | π_3g^4 |
| Total Profits | | π_1 | $\pi_1g+\pi_2$ | $\pi_1g^2+\pi_2g+\pi_3$ | $\pi_1g^3+\pi_2g^2+\pi_3g+\pi_4$ | $\pi_1g^4+\pi_2g^3+\pi_3g^2+\pi_4g^1$ | etc | etc |
| Annual Depreciation Charges: | | | | | | | | |
| Investment 1 | | d_1 | d_2 | d_3 | d_4 | 0 | 0 | 0 |
| Investment 2 | | | d_1g | d_2g | d_3g | d_4g | 0 | 0 |
| Investment 3 | | | | d_1g^2 | d_2g^2 | d_3g^2 | d_4g^2 | 0 |
| Investment 4 | | | | | d_1g^3 | d_2g^3 | d_3g^3 | d_4g^3 |
| Investment 5 | | | | | | d_1g^4 | d_2g^4 | d_3g^4 |
| Total Annual Depreciation Charges | | d_1 | d_1g+d_2 | $d_1g^2+d_2g+d_3$ | $d_1g^3+d_2g^2+d_3g+d_4$ | $d_1g^4+d_2g^3+d_3g^2+d_4g$ | etc | etc |
| Accumulative Depreciation Charges | | | | | | | | |
| | | d_1 | d_1+d_2 | $(d_1+d_3+d_3)$ | $(d_1+d_2+d_3+d_4)$ | $(d_1+d_2+d_3+d_4)g$ | | |
| | | | d_1g | $(d_1+d_2)g$ | $(d_1+d_2+d_3)g$ | $(d_1+d_2+d_3)g^2$ | | |
| | | | | d_1g^2 | $(d_1+d_2)g^2$ | $(d_1+d_2)g^3$ | | |
| | | | | | d_1g^3 | d_1g^4 | etc | etc |

The written down value of the capital stock is then found by deducting cumulative depreciation from the gross capital stock. But because in year t the cumulative depreciation figures include the complete write off of the asset constructed during year $t-n$ i.e. $(d_1 + d_2 + \dots + d_n)g^{t-n}$ an extra g^{t-n} must be added to the gross capital stock to avoid double counting, since this asset is shown as completely written off in year t 's gross capital stock. Thus the written down, or net, capital stock at the end of year t is:

$$(1) + g^{t-n} - (4) \dots\dots\dots (5)$$

The equilibrium ratios are then found by dividing equations (1) to (5) by g^{t-n} . These simple relationships can then be used to obtain conventional rates of return under conditions of steady growth.

An example:

These results are illustrated for a simple model assuming a five-year life; straight line depreciation that is consistent with a 15% return; and 10% growth. The cash flows, etc. for the investment in year 0 are tabulated in Table 2.

On using $(2) \div g^{t-n}$, the equilibrium cash flows are:

$$\begin{array}{rcl} 1.75 \times 1.1^4 & = & 2.5622 \\ 1.60 \times 1.1^3 & = & 2.1296 \\ 1.45 \times 1.1^2 & = & 1.7545 \\ 1.30 \times 1.1 & = & 1.4300 \\ 1.15 & = & 1.1500 \\ \hline & & 9.0263 \end{array}$$

On using $(3) \div g^{t-n}$, the equilibrium annual depreciation charges are:

$$\begin{array}{rcl} 1 \times 1.1^4 & = & 1.4641 \\ 1 \times 1.1^3 & = & 1.3310 \\ 1 \times 1.1^2 & = & 1.2100 \\ 1 \times 1.1 & = & 1.1000 \\ 1 & = & 1.0000 \\ \hline & & 6.1051 \end{array}$$

On using $(1) \div g^{t-n}$, the equilibrium gross capital stock is:

$$(1.1 + 1.1^2 + \dots + 1.1^5) \times 5 = 33.5780$$

On using $(4) \div g^{t-n}$ the cumulated depreciation charges are:

$$\begin{array}{rcl} 5 & = & 5.0000 \\ 4 \times 1.1 & = & 4.4000 \\ 3 \times 1.1^2 & = & 3.6300 \\ 2 \times 1.1^3 & = & 2.6620 \\ 1 \times 1.1^4 & = & 1.4641 \\ \hline & & 17.1561 \end{array}$$

So that the written down capital stock is:

$$33.5780 + 5.0000 - 17.1561 = 21.4219$$

And the conventional rate of return is:

$$\frac{9.0263 - 6.1051}{21.4219} = 13.6364\%$$

However, because the depreciation charges used in Table 2 are the economically-correct ones given the cash flows, the conventional return should also be 15% - the scheme's actual DCF return. The return shown above is exactly 10% below what it should be (i.e. $1.1 \times 13.6364 = 15.0$). This is because the net capital stock is valued at the 31st December in year t ; but since annual rates are being calculated this year's cash flow is generated by the opening net capital stock at 1st January in year t , so in order to get the correct rate of returns the net capital stock at 31st December must be divided by g . This is the procedure that will be followed in the analysis below.

The no growth case:

This case is analysed first, because it provides the framework for explaining exactly why it is that conventional rates of return fail to give the underlying rate of return, even under ideal conditions when everything in the system simply repeats itself year after year. Two basic forms of cash flows are considered. Firstly, profits declining steadily to zero. Under strongly-competitive conditions this is probably the most likely general form of profit profile; there are two reasons for this. Newer generations of plant will usually embody a technology superior to that of older plants so that in real terms costs will decline and under competitive conditions prices will, consequently, decline in real terms. Secondly, as

TABLE 2

| Year | Cash Flow | Depreciation | Interest | Written Down Value at Year's End |
|------|-----------|--------------|----------|----------------------------------|
| 0 | -5 | | | 5 |
| 1 | 1.75 | 1 | 0.75 | 4 |
| 2 | 1.60 | 1 | 0.60 | 3 |
| 3 | 1.45 | 1 | 0.45 | 2 |
| 4 | 1.30 | 1 | 0.30 | 1 |
| 5 | 1.15 | 1 | 0.15 | 0 |

plant gets older it will be subject to greater wear and tear and hence its costs will increase and/or its output or quality of output will decline. Both of these factors will lead to declining real cash flows during the asset's life. Under competitive conditions the optimal replacement time of this asset will coincide with market price equalling operating cost.³ The other major profile is for initially increasing profits and then declining profits, the decline being associated with the factors discussed above. Profits could initially increase because the nature of the investment required initial over capacity, relative to current demand, for example rail and road facilities associated with new mining ventures. The profits from particular oil or gas fields also typically show this pattern. Often investment in new plant is on such a scale that initially a large proportion of output has to be exported at low realized prices, but as home demand grows output can be switched to the home market and higher prices realized. This will result in initially increasing profits while output is being switched to the home market, followed by their decline. The most common form of cash profile used in investment appraisal is that of constant profits; but because it is so unrealistic it is ignored in this analysis.

Table 3 shows an investment for year 0 and its cash flow which is assumed to decline linearly to zero. The project is assumed to earn a 10% return. Also shown

are the economically-correct depreciation charges for the project. These are calculated by finding the project's present value at the end of each year. Thus the present value at the end of year 17 is 5.13, i.e.:

$$\frac{3.00}{1.1} + \frac{2.00}{1.1^2} + \frac{1.00}{1.1^3}$$

The economic depreciation charge for year t is found by deducting the P.V. at the end of year t from the P.V. at the end of year $t-1$. The cash flow less economic depreciation in year t , divided by P.V. at the end of year $t-1$ always equals the project's rate of return. These economic depreciation charges will be compared below with arbitrary methods of depreciation to show why even in equilibrium conditions the conventional returns are still wrong.

Under conditions of zero growth relationships (1)-(4) become very simple. The gross capital stock (i.e. (1)) becomes: $n \times 1$ (where n is the life of plant, and 1 is the unit of investment in year 0); annual profits (i.e. (2)) become: $\pi_1 + \pi_2 + \dots + \pi_n$; annual depreciation charges (i.e. (3)) become $d_1 + d_2 + \dots + d_n = \pi$; and cumulative depreciation charges (i.e. (4)) become: $nd_1 + (n-1)d_2 + \dots + d_n$, which for straight

line depreciation = $\frac{n}{2}(n+1) \times \frac{1}{n}$, and for declining

balance depreciation = $n-k \frac{(1-k^{n-1})}{1-k}$, where $(1-k) \cdot 100$

³H. R. Fisher, 'Obsolescence and Optimal Replacement Timing', 'The Chemical Engineer', April 1963.

⁴ $d_i = \pi/n$, all i

$\frac{n(n+1)}{2} = n + (n-1) + (n-2) + \dots + 1$

TABLE 3

Economic Depreciation for Linearly Declining Profits

| Year | Cash Flow | Discounted Cash Flow 10% | Project's Present Value at Year's End | Economic Depreciation |
|------|-----------|--------------------------------|---|--------------------------|
| 0 | -114.86 | | | |
| 1 | 20.00 | 18.18 | 106.35 | 8.51 |
| 2 | 19.00 | 15.70 | 97.99 | 8.36 |
| 3 | 18.00 | 13.52 | 89.79 | 8.20 |
| 4 | 17.00 | 11.61 | 81.76 | 8.02 |
| 5 | 16.00 | 9.93 | 73.94 | 7.82 |
| 6 | 15.00 | 8.47 | 66.33 | 7.61 |
| 7 | 14.00 | 7.18 | 58.96 | 7.37 |
| 8 | 13.00 | 6.06 | 51.86 | 7.10 |
| 9 | 12.00 | 5.09 | 45.05 | 6.81 |
| 10 | 11.00 | 4.24 | 38.56 | 6.49 |
| 11 | 10.00 | 3.51 | 32.41 | 6.15 |
| 12 | 9.00 | 2.87 | 26.65 | 5.76 |
| 13 | 8.00 | 2.32 | 21.31 | 5.34 |
| 14 | 7.00 | 1.84 | 16.58 | 4.86 |
| 15 | 6.00 | 1.44 | 12.09 | 4.36 |
| 16 | 5.00 | 1.09 | 8.30 | 3.79 |
| 17 | 4.00 | 0.79 | 5.13 | 3.17 |
| 18 | 3.00 | 0.54 | 2.64 | 2.49 |
| 19 | 2.00 | 0.33 | 0.91 | 1.73 |
| 20 | 1.00 | 0.15 | 0.00 | 0.91 |

298959

is the percentage rate of write off.⁵

Using these relationships the table of results (Table 4) can be drawn up for the straight line depreciation case. Over the ranges considered, straight line depreciation results in an underestimate of the actual rate of return being obtained on assets, though as plant life increases there is a slight tendency for the error to decline. The reason for these results can be found from examining Table 3 which shows the economic depreciation charges for the 20-year life, 10% return case. As can be seen, the economic depreciation charges start off at approximately 1½ times the size of the straight line charge and steadily decline to approximately 16% of the straight line charge in year 20. In the no growth case the annual profits and depreciation charges are the same whatever method of depreciation is used, and so is the gross capital stock. But the cumulative depreciation charges are $nd_1 + (n-1)d_2 + \dots + d_n$.

TABLE 4

**Actual and Conventional Rates of Return:
Declining Profits and Straight Line
Depreciation**

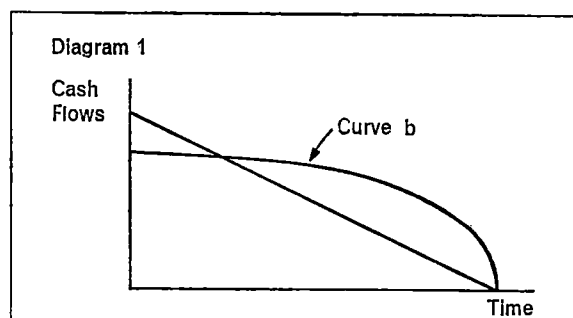
| <i>Life of Plant</i> | <i>Actual Return</i> | <i>Conventional Return</i> |
|----------------------|--------------------------|--------------------------------|
| 15 | 5% | 3.75% |
| 15 | 10% | 7.79% |
| 15 | 15% | 12.08% |
| 20 | 5% | 3.75% |
| 20 | 10% | 7.89% |
| 20 | 15% | 12.30% |
| 25 | 5% | 3.78% |
| 25 | 10% | 8.01% |
| 25 | 15% | 12.53% |

So that the early depreciation charges are given more weight. Because the initial economic charges are higher than the straight line charges, the straight line charges fail to write enough off the gross capital stock and hence underestimate the return on the assets.

As Table 2 illustrates, straight line depreciation implies linearly declining cash flows but not to zero because of the final depreciation charge. However, the longer the life the smaller the annual depreciation charge and hence the more nearly the cash flows associated with straight line depreciation approximate to those declining linearly to zero. Hence the better approximation as plant life increases.

These results will not hold for all cases of declining profit. If profits decline initially at a more gradual rate than for linearly declining profits, as for

example curve B in diagram 1, then the economic depreciation charges may be initially increasing⁶ so possibly implying a slower write down of capital than the straight line method does under conditions of



zero growth. Such shaped profit profiles might well obtain when obsolescence is due to 'fashion' factors, as with cars, rather than embodied technical progress as such.

With declining balance depreciation conventional rates of return can under or over estimate the actual rate of return, under conditions of zero growth, depending upon the rate of write off. This conclusion, which is obvious from the discussion above, is illustrated by two examples in Table 5. The 14.5% rate

TABLE 5

**Actual v's Conventional Rates of Return:
Declining Profits with Twenty-Year Life and
Declining Balance Depreciation**

| <i>Rate of Write-Off</i> | <i>Actual Return</i> | <i>Conventional Return</i> |
|------------------------------|--------------------------|--------------------------------|
| 14.59% | 10% | 12.62% |
| 7.41% | 10% | 7.81% |

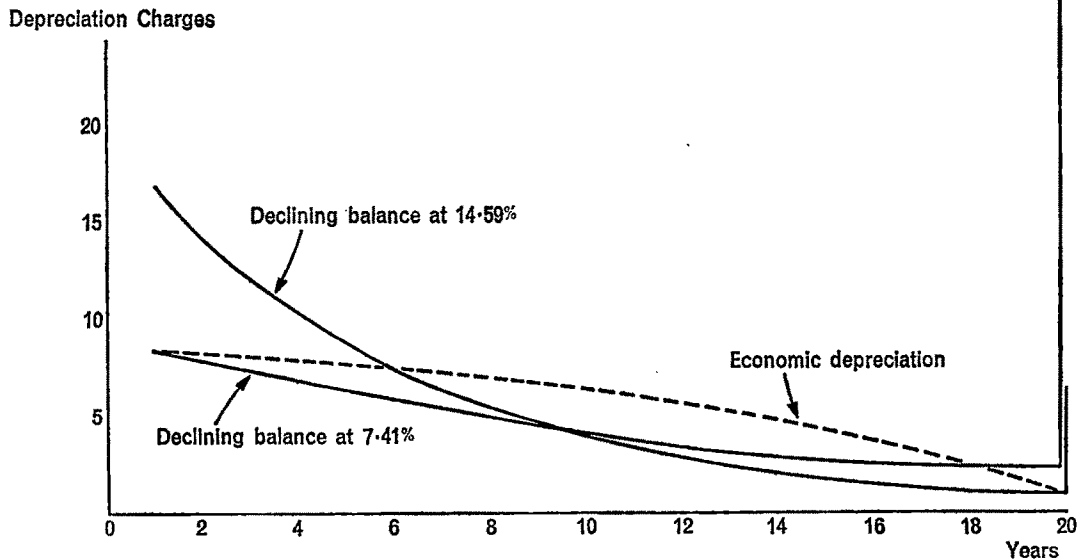
of write off was chosen so that the final depreciation charge would equal the straight line charge. The 7.4% rate of write off is equal to the first year's charge when economic depreciation is used. The reason for these results can be seen from Diagram 2 which compares the two declining balance charges with the economic charges. In the first declining balance case the depreciation charges are significantly greater than the economic charges for the first five years and because of the higher weighting of the initial charges

⁶ The extreme case of curve b is a rectangular profit profile which will have increasing economic depreciation charges throughout its life.

⁵ See appendix.

Diagram 2

Declining Balance and Economic Depreciation Charges
for Cash Flows from Table 3



the 14.59% declining balance case writes off the capital stock more quickly than the economic charges. The converse applies to the 7.41% declining balance case.

The case of initially-increasing cash flows, followed by decreasing to zero cash flow, under zero growth, is

now considered. The particular set of cash flows considered and the associated economic depreciation charges for a 10% DCF return are shown in Table 6, while Table 7 summarizes the conventional returns against four levels of actual returns for the straight line depreciation case. For the 10% return case the conventional return is seen to be too high by 1.82 percentage points. This is because for the first six years of the project the economic depreciation charges are much lower than the straight line charge of 3.078, and this outweighs the too low straight line charges for the years 7 to 17. However, as the discount rate gets lower it can be checked that the initial differences between the two sets of charges get smaller and that at very low discount rates the straight line charges fail to write enough off of the capital stock. As well as depending on the discount rate the error in the conventional return will depend upon the time period considered and the relationship between the initial

TABLE 6
Initial Increasing then Declining Profits and
Associated Economic Depreciation Charges
at 10% DCF

| Year | Cash Flows | Economic Depreciation at 10% DCF |
|------|------------|-------------------------------------|
| 0 | -61.56 | |
| 1 | 4.00 | -2.16 |
| 2 | 5.00 | -1.38 |
| 3 | 6.00 | -0.51 |
| 4 | 7.00 | 0.44 |
| 5 | 8.00 | 1.48 |
| 6 | 9.00 | 2.64 |
| 7 | 10.00 | 3.90 |
| 8 | 11.00 | 5.28 |
| 9 | 12.00 | 6.82 |
| 10 | 11.00 | 6.49 |
| 11 | 10.00 | 6.15 |
| 12 | 9.00 | 5.76 |
| 13 | 8.00 | 5.34 |
| 14 | 7.00 | 4.86 |
| 15 | 6.00 | 4.36 |
| 16 | 5.00 | 3.79 |
| 17 | 4.00 | 3.17 |
| 18 | 3.00 | 2.49 |
| 19 | 2.00 | 1.73 |
| 20 | 1.00 | 0.91 |

TABLE 7
Actual v's Conventional Rates of Return:
Increasing then Declining Profits and Straight
Line Depreciation

| Life of Plant | Actual Return | Conventional Return |
|---------------|---------------|------------------------|
| | 1% | 0.53% |
| | 5% | 5.18% |
| 20 | 10% | 11.82% |
| | 15% | 19.82% |

build up of the cash flows and the decline in the cash flows. The shorter and less severe the initial build up of profits, the less likely that the conventional return will overestimate the actual rate of return.

Table 8 shows the impact of long plant construction periods on the observed rate of return, assuming linearly declining profits and straight line depreciation. Over the ranges considered, the introduction of long plant construction periods reduces the difference between the actual and the conventional rates of return. Indeed, if the construction periods were increased any further the conventional returns would finally exceed the actual returns. However, complete generalisations cannot be made as the formula shown below indicates:

$$\text{Conventional Return} = \frac{\sum_{i=1}^n \pi_i \left[\frac{1-(1+r)^c}{1-(1+r)} \right] \frac{1}{c} - 1}{\frac{1}{2}(n+1) + \left[\frac{(c+1)}{2} - 1 \right]}$$

TABLE 8

The Impact of Long Construction Periods, Assuming Linearly Declining Profits and Straight Line Depreciation

| Construction Period | Plant Life | Actual Rate of Return | Conventional Rate of Return |
|---------------------|------------|-----------------------|-----------------------------|
| 2 | 15 | 5% | 3.92% |
| 3 | 15 | 5% | 4.07% |
| 4 | 15 | 5% | 4.22% |
| 2 | 20 | 5% | 3.90% |
| 3 | 20 | 5% | 4.04% |
| 4 | 20 | 5% | 4.56% |
| 2 | 25 | 5% | 3.91% |
| 3 | 25 | 5% | 4.05% |
| 4 | 25 | 5% | 4.18% |
| 2 | 15 | 10% | 8.28% |
| 3 | 15 | 10% | 8.78% |
| 4 | 15 | 10% | 9.30% |
| 2 | 20 | 10% | 8.36% |
| 3 | 20 | 10% | 8.84% |
| 4 | 20 | 10% | 9.34% |
| 2 | 25 | 10% | 8.47% |
| 3 | 25 | 10% | 8.94% |
| 4 | 25 | 10% | 9.44% |

Where the π_i are the cash flows from the investment in year zero, n is the plant life, c is the construction period, where it is assumed that construction costs occur evenly throughout the c years, and r is the

actual rate of return.⁷ Thus the longer the construction period, the larger is the increase in the cash flow needed to achieve the required return, and similarly for the net capital stock. The movement of the whole expression with respect to c will depend upon the rate of return and $\sum \pi_i$, which itself reflects the shape of the profit profile and the discount rate. Similar considerations would also apply in the case of declining balance depreciation.

Table 9 shows the impact of writing off plant over the wrong number of years when straight line depreciation is used. In deriving these results it should be noted that while the relationships for equilibrium cash flows and annual depreciation charges remain unchanged the formula for the cumulative depreciation charges alters. When, for example, the straight depreciation rate is based on a 15-year instead of a 25-year life the formula for cumulative de-

preciation is $\left[\frac{15}{2} \times 16 \right] \frac{1}{15}$ instead of, $\left[\frac{25}{2} \times 26 \right] \frac{1}{25}$,

while when the rate is based on a 35-year instead of a 25-year basis the cumulative depreciation becomes

$\left[\frac{25}{2} \times 26 - 1 \right] \frac{1}{35} + \left[1 - \frac{24}{35} \right]$ for a unit investment in

each year. The above relationship is based on the assumption that for individual plant the balance of the written down stock is completely written off in the last year of the plant's life. As can be seen from the table, writing off too quickly increases the conventional rate of return: and conversely. This is a completely general conclusion for straight line depreciation.

TABLE 9

The Impact of Writing Off Assets Over the Wrong Period: Straight Line Depreciation and Linearly Declining Profits, with Actual Life of 25 Years

| Life Overestimated Or Underestimated | Actual Return | Conventional Return |
|--------------------------------------|---------------|---------------------|
| 10 Years Underestimated | 10% | 13.01% |
| 10 Years Overestimated | 10% | 6.33% |

⁷ The formula is derived by noting that the capitalisation of the plant construction costs is:-

$$\frac{1}{c} + \frac{1}{c}(1+r) + \dots + \frac{1}{c}(1+r)^{c-1} = \frac{1}{c} \left[\frac{1-(1+r)^c}{1-(1+r)} \right]$$

While if a table similar to Table 1 is constructed it can be checked that the total gross value of the capital stock is increased by $\left[\frac{c+1}{2} - 1 \right]$ units.

If the rate at which the capital stock is written down in the declining balance case is unaffected by what is assumed about plant life, then the balance of the written down capital stock will be written off in the final year of the plant's life, and therefore no problems will arise. But if the rate of write off is affected by the assumed life of the plant then this will affect the conventional rate of return. This is illustrated in Table 10, below. The rate used in obtaining the results was that if it was estimated that the plant would last n years, then the write off in year n would be $1/n$ of the original investment. It was also assumed that the plant was finally written off in the last year of its life, not with a year's lag. The shorter the originally-assumed life of the plant the higher the conventional return. This result clearly follows from the previous discussion comparing economic depreciation with the other methods. The shorter the assumed life, the larger the initial rate of write off and hence the larger the initial depreciation charge.

TABLE 10

Impact of Writing Off Assets Over the Wrong Period: Declining Balance Depreciation and Linearly Declining Profits with Actual 20-Year Life

| Initial Write Off Based on | Actual Return | Conventional Return |
|----------------------------|---------------|---------------------|
| 15 Years | 10% | 14.89% |
| 20 Years | 10% | 12.62% |
| 25 Years | 10% | 11.15% |

The growing capital stock case:

As the analysis in the previous section shows, there is no consistent relationship between conventional returns and actual returns, the former being affected by the shape of the cash flow profile; the method of depreciation used; and the rate at which the net capital stock is written down, whether straight line or declining balance. Once growth is allowed for the situation becomes even more complicated. For example, the cases of declining profits and straight line depreciation that were shown in Table 4 all resulted in the conventional rate of return underestimating the actual rate of return, but if the growth in capital stock is rapid the conventional return will be too high, although the rate of growth required to do this will have to be fairly high; this is illustrated in Table 11.

As can be seen, the higher the rate of growth in the capital stock the higher the conventional returns are. With 9% growth the conventional return virtually equals the actual return, but the former will exceed

the latter at higher rates of growth. Increasing plant life makes very little difference to the results. The reason for this result can be explained by Diagram 3.

TABLE 11

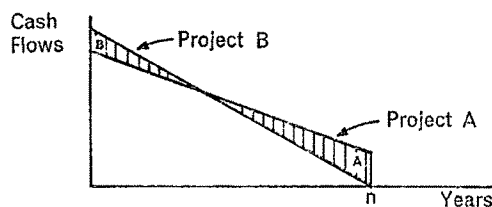
Conventional Returns with Linearly Declining Profits, Straight Line Depreciation, and Growth

| Annual Growth Rate in Capital Stock | Plant Life | Actual Return | Conventional Return |
|-------------------------------------|------------|---------------|---------------------|
| 0% | 20 | 10% | 7.89% |
| 3% | 20 | 10% | 8.70% |
| 6% | 20 | 10% | 9.34% |
| 9% | 20 | 10% | 9.85% |
| 0% | 25 | 10% | 8.01% |
| 3% | 25 | 10% | 8.81% |
| 6% | 25 | 10% | 9.42% |
| 9% | 25 | 10% | 9.88% |

Project A is a scheme that has cash flows implying straight line economic depreciation; while Project B's cash flows imply declining economic depreciation (see Table 3). For project A the conventional returns would be correct when straight line depreciation is used, as illustrated by the earlier example. For Project B the written down capital stock and the annual depreciation charges will be the same as for A, the only difference being the cash flows. Reference to relationship 2 or Table 1, will show that under growth the initial cash flows of a project have a higher weighting than the final cash flow; this differential weighting being greater the faster the growth in the capital stock. Thus a scheme with cash flows similar to those of B relative to those of A will have its total cash position growing at a more rapid rate in equilibrium conditions than A's cash flows. So that for some rate of growth B's equilibrium cash flows will exceed A's. The converse will apply to low rates of growth since the hatched area B is smaller than hatched area A, because of discounting.

Diagram 3

Comparison of Cash Flows Consistent with Different Depreciation Charges



Again the situation is even more varied when declining balance depreciation is used. The general nature of the results depending upon the rate at which assets are written down. This is illustrated in Table 12 which combines different growth rates for capital stock with a 5% and 15% rate of depreciation. When declining balance depreciation is at the 5% rate the conventional return is seen to increase with the rate of growth of the capital stock. But when assets are written down at a rate of 15% a year the opposite holds: as the growth in capital stock increases the conventional return declines. These results can again be explained by an analysis similar to that illustrated by Diagram 2.

TABLE 12

Effect of Growth on Conventional Returns with Declining Profits 20-Year Life and Declining Balance Depreciation

| <i>Growth of Capital Stock</i> | <i>Rate of Depreciation</i> | <i>Actual Return</i> | <i>Conventional Return</i> |
|--------------------------------|-----------------------------|----------------------|----------------------------|
| 0% | 5% | 10% | 6.46% |
| 3% | 5% | 10% | 7.90% |
| 6% | 5% | 10% | 8.47% |
| 9% | 5% | 10% | 9.57% |
| 0% | 15% | 10% | 12.93% |
| 3% | 15% | 10% | 11.95% |
| 6% | 15% | 10% | 11.05% |
| 9% | 15% | 10% | 10.25% |

In the case of initially increasing then decreasing profits the results are even more general. Not only will the conventional return be affected by the method of depreciation used, but also the length and the rate of increase in cash flows in the initial years relative to the same factors in the years during which profits decline. If returns are underestimated in the no growth case then they will probably be overestimated if the growth in capital stock is rapid enough. The converse will also tend to apply.

The problem of inflation:

In general terms the consequences of introducing inflation will not affect the kind of outcomes considered in the previous sections, provided it is at a steady rate. The main point to note is that the zero growth case would now become a 'growth' case in the sense that the monetary values of profits, gross investment and hence depreciation charges would be growing in a manner analogous to the growth cases considered. It is worth noting, however, that if the inflation is moderate, it could well be offset by technical progress

since newer generations of plant will have lower real costs than older ones since they will embody the fruits of general technical advance.

The rate of return earned by the Companies' Sector

In a previous article⁸ the author concluded that the real gross rate of return on capital employed in the companies' sector fell from about 9% to 10% in the mid to later 1950s to below 6% in 1970. This conclusion was based upon examining gross trading profits less depreciation relative to net fixed assets plus net working capital. A deduction of one or two percentage points was then made from these figures to allow for the construction and commissioning periods of typical major schemes. The written down fixed assets and annual depreciation charges were updated to take account of inflation which is separately estimated for broad categories of fixed assets. The figures, apart from working capital, were taken from the 'Blue Book'. The method of depreciation used by the Central Statistical Office is straight line, and the average life of plant is approximately 25 years.

Given the implications of the previous analysis it could reasonably be asked to what extent these results are reliable. It is the purpose of this section to attempt to answer this problem. The general conclusion of declining returns cannot really be questioned since company profits as a proportion of G.D.P. were declining throughout the period, while their gross investment was increasing. Moreover, it will be suggested below that the general order of magnitude of the estimated returns was about right, though possibly a little on the low side.

If the assumption of linearly declining profits is made then Table 4 indicates that in the zero growth case the actual rate of return would have been underestimated by about two percentage points if it was actually in the region of 10%. This underestimate can be regarded as the likely maximum negative error (i.e. observing 8% instead of 10%). It was argued previously, that under competitive conditions the typical cash flow profile was one of declining profits. While generally true, a number of qualifications need to be made. Typically larger schemes do not achieve full production immediately after plant construction but may take a year or more to reach full production. This initial cash flow build-up would be superimposed upon the general tendency for the cash flows to decline. Larger schemes would also be subject to a plant construction period of over a year. If it is assumed that

⁸ *Op. cit.*, p. 98.

on average plant construction periods are two years and that 50% of potential profits are obtained in the first year of production the declining cash flow case would give an observed return of 9% compared with an actual return of 10%. Moreover, this makes no allowance at all for those projects that do have an initial period of increasing, followed by decreasing cash flows. Indeed, even in the more common case of continually declining profits, there could be a period of increasing profits, apart from the commissioning period. In many industries additions to capacity may be far too large to be absorbed by a few years growth on the home market. Initially, therefore, a very high proportion of the output would have to be exported and supply gradually switched to the home market as demand there increased. Because the net realised price from exports is usually significantly lower than that achieved on the home market, this could well result in a period of initially increasing profits. When all these factors are considered it is not unreasonable to guess that the observed return is not far different from the actual return. However, given all these arguments it could well be an over-adjustment to make a deduction of one or two percentage points to the observed return to 'allow for the construction and build-up to full production of typical schemes'.

The discussion above was in the context of zero growth in the capital stock. Since the war, however, real gross investment in the companies sector had been growing at about 7% a year until several years ago. If the declining profit case is considered, but with the construction and build-up assumptions made above, the observed return would increase by a further percentage point.

On attempting to assess, in the very general way done here, the likely returns to the companies' sector, my previous conclusion that the real return on capital in the companies' sector was about 9 to 10% between 1956 to 1965, and under 6% by 1970, needs to be only slightly modified. The best guess that can be made, given the analysis of this paper, is that the above returns should be increased by about a percentage point.

Appendix: Formulae Used for Calculations

This appendix derives the very simple formulae used for calculating the relationships used in the text. They provide a convenient basis for anyone who wishes to explore these relationships further.

Formula for Present Value with Profits Linearly

Declining to Zero

Given the assumption of linearly declining profits, this relationship gives the appropriate capital cost. The discounted cash flows under the given assumptions are:-

Conclusions:

The analysis shows that even in ideal conditions it is not possible to take conventional returns at their face value; they can be above or below the actual return by a significant margin. The conventional returns are affected by a large number of factors which are listed below.

- (a) The method of depreciation used.
- (b) The assumed life of plant.
- (c) The actual life of the plant.
- (d) The rate of write-off with declining balance depreciation.
- (e) The rate of growth of the capital stock.
- (f) The cash flow profile.
- (g) The rate of return itself.

Thus, even in conditions of steady growth (or decline) and a constant rate of inflation, the earning capacity of companies cannot be directly assessed from conventional returns. It might be possible, however, to get somewhat better comparisons by attempting to analyze company results along the lines suggested by the analysis outlined in this paper. Indeed, in a steady-state world, it would be quite simple to value shares since whatever methods of depreciation were used, observed profits would grow at a constant rate. Difficulties would arise when growth rates changed.

Unfortunately, however, conditions do not usually approximate to steady state conditions, apart possibly from economies as a whole, and perhaps occasionally even particular industries for certain periods of their history. In practice only a few industries will approximate to steady-state conditions, and hardly any firms at all. In these cases both the level and the trend of observed profits will be a reflection of a company's position in its investment cycle, so that using such figures could give rise to very misleading conclusions.

Nevertheless, in spite of these problems and hazards of interpretation conclusions have to be drawn and decisions made. By being aware of possible errors of interpretation and the reasons for these errors, some major mistakes might be avoided.

$$P.V. = nk + (n-1)k^2 + (n-2)k^3 + \dots + k^n$$

where n = the initial cash flow and the plant life, and $k = \frac{1}{1+r}$, where r is the rate of return.

$$\frac{1}{1+r}$$

$$P.V. = nk + (n-1)k^2 + (n-2)k^3 + \dots + k^n$$

$$\therefore kPV = nk^2 + (n-1)k^3 + \dots + 2k^n + k^{n+1}$$

$$\therefore kPV - PV = -nk + k^2 + k^3 + \dots + k^n + k^{n+1}$$

$$\therefore kPV - PV - nk + k \left[\frac{k(1-k^n)}{1-k} \right]$$

$$P.V. = \frac{nk}{1-k} - \frac{k^2(1-k)^n}{(1-k)^2} \dots \quad (1A)$$

Formulae for Present Value with Linearly Increasing, then Linearly Declining to Zero Profits

$$\text{Cash Flows} = [n + (n+1)(n+2) \dots (n+1)] + [(n+1-1)(n+1-2) + \dots + 1]$$

Using the above notation the present value of the first expression in square brackets is:

$$\begin{aligned} PV_1 &= nk + (n+1)k^2 + \dots + (n+1)k^{1+1} \\ \therefore kPV_1 &= nk^2 + \dots + (n+1-1)k^{1+1} + (n+1)k^{1+2} \\ \therefore PV_1(1-k) &= nk + [k^2 + k^3 + \dots + k^{1+1}] - (n+1)k^{1+2} \\ PV_1 &= \frac{nk}{(1-k)} + \frac{k^2(1-k)}{(1-k)^2} - \frac{(n+1)k^{1+2}}{(1-k)} \end{aligned}$$

On using the previous formulae, the discounted value of the complete cash flow is:

$$\begin{aligned} &\frac{nk}{(1-k)} + \frac{k^2(1-k)}{(1-k)^2} - \frac{(n+1)k^{1+2}}{(1-k)} \\ &+ k^{1+1} \left[\frac{(n+1-1)k}{(1-k)} - \frac{k^2(1-k^{n+1-1})}{(1-k)^2} \right] \dots \quad (2A) \end{aligned}$$

Cumulative Declining Balance Depreciation: Zero Growth Case

This is relationship (4) in the text when $g=1$. The written down value of the capital stock and the consequent depreciation charges for a write off rate w are:

| Year | Written Down Value at Year End | Annual Depreciation Charges |
|----------|--------------------------------|-----------------------------|
| 0 | 1.0 | |
| 1 | $0 \cdot (1-w)$ | $1 - (1-w)$ |
| 2 | $0 \cdot (1-w)^2$ | $(1-w) - (1-w)^2$ |
| 3 | $0 \cdot (1-w)^3$ | $(1-w)^2 - (1-w)^3$ |
| \vdots | \vdots | \vdots |
| $(n-1)$ | $0 \cdot (1-w)^{n-1}$ | $(1-w)^{n-2} - (1-w)^{n-1}$ |
| n | 0.0 | $(1-w)^{n-1}$ |

So that the cumulative depreciation charges are:

$$n[1 - (1-w)] + (n-1)[(1-w) - (1-w)^2] + (n-2)[(1-w)^2 - (1-w)^3] + \dots + (1-w)^{n-1}$$

On rearranging this expression and writing $(1-w) = p$ we get cumulative depreciation charges, CDC, equalling:

CDC =

$$\begin{aligned} &[n + (n-1)p + (n-2)p^2 + (n-3)p^3 + \dots + 2p^{n-2} + p^{n-1}] \\ &- [np(n-1)p^2 - (n-2)p^3 - \dots - 3p^{n-2} - 2p^{n-1}] \\ \therefore CDC &= n - p - p^2 - p^3 - \dots - p^{n-2} - p^{n-1} \end{aligned}$$

$$\therefore CDC = \left[n - p \frac{(1-p^{n-1})}{1-p} \right] - \dots - \dots \quad (3A)$$

Annual Profits Under Growth for Linearly Declining Case

This is relationship (2) in the text when $g \neq 1$. With linearly declining profits (2) becomes:

$$\begin{aligned} LDP &= ng^{n-1} + (n-1)g^{n-2} + (n-2)g^{n-3} + \dots + 2g + 1 \\ \therefore gLDP &= ng^n + (n-1)g^{n-1} + (n-2)g^{n-2} + \dots + 2g^2 + g \\ \therefore LDP(1-g) &= -ng^n + \frac{(1-g^n)}{(1-g)} \\ \therefore LDP &= \frac{-ng^n}{(1-g)} + \frac{(1-g^n)}{(1-g)^2} \dots \quad (4A) \end{aligned}$$

Annual Declining Balance Charges Under Growth

This is relationship (3) of the text when $g \neq 1$, for the declining balance method of depreciation. Under these assumptions and using the above notations (3) becomes:

$$\begin{aligned} ADC &= (1-p)g^{n-1}(p-p^2)g^{n-2} + \dots + (p^{n-2} - p^{n-1})g + p^{n-1} \\ \text{ie } ADC &= [g^{n-1} + pg^{n-2} + p^2g^{n-3} + \dots + p^{n-2}g + p^{n-1}] + [-pg^{n-1} - p^2g^{n-2} - p^3g^{n-3} - \dots - p^{n-1}g] \end{aligned}$$

On writing the first and second expressions in square brackets as ADC_1 and ADC_2 respectively, we get:

$$ADC_1 = g^{n-1} + pg^{n-2} + p^2g^{n-3} + \dots + p^{n-2}g + p^{n-1}$$

$$\therefore \frac{p}{g} ADC_1 = pg^{n-2} + p^2g^{n-3} + \dots + p^{n-2}g + p^{n-1} + \frac{p^n}{g}$$

$$ADC_1(1-p) = \frac{g^{n-1} - p^n}{g}$$

$$\therefore ADC_1 = [g^{n-1} - p^n/g] \div (1-p/g)$$

Since $ADC_2 = -pADC_1 + p^n$, we get:

$$ACD = [(g^{n-1} - p^n/g) \div (1-p/g)] [1-p] + p^n \dots \quad (5A)$$

Cumulative Straight Line Depreciation Under Growth

This is relationship (4) of the text with $g \neq 1$, and straight line depreciation. With these assumptions (4) becomes:

$$CSD = \frac{1}{n} [n + (n-1)g + (n-2)g^2 + \dots + g^{n-1}]$$

$$\therefore \text{CSD}(1-g) = \frac{1}{n} [n - g - g^2 - \dots - g^n]$$

$$\therefore \text{CSD} = \frac{1}{n} \left[\frac{n}{1-g} - \frac{g(1-g^n)}{(1-g)^2} \right] \dots \dots \dots (6A)$$

Cumulative Declining Balance Depreciation Under Growth

This relationship is as above but with declining balance replacing straight line depreciation. On referring to relationship (4) in the text and the table at the beginning of the derivation of (3A) and remembering that $(1-w)=p$, relationship (4) becomes:

$$\begin{aligned} \text{CDB} &= 1 + (1-p^{n-1})g + (1-p^{n-2})g^2 + \dots + (1-p)g^{n-1} \\ &= \begin{cases} 1 + g + g^2 + \dots + g^{n-1} \\ -p^{n-1}g - p^{n-2}g^2 - \dots - pg^{n-1} \end{cases} \end{aligned}$$

$$\text{The first term} = \frac{1-g^n}{1-g}$$

On denoting the second term by CDB_2 we get:

$$\text{CDB}_2 \frac{g}{p} = -p^{n-2}g^2 - \dots - pg^{n-1} - g^n$$

$$\therefore \text{CDB}_2 \left(1 - \frac{g}{p}\right) = -p^{n-1}g + g^n$$

$$\therefore \text{CDB} = \frac{1-g^n}{(1-g)} + \frac{g^n}{(1-\frac{g}{p})} - \frac{p^{n-1}g}{(1-\frac{g}{p})}$$

Straight line depreciation and capital stock under growth

These two expressions are simply geometric progressions.

Problems in Interpreting Prospectus Profit Forecasts

Susan Dev

This paper is concerned with the problems of interpreting prospectus profit forecasts and with reconciling subsequent results reported in annual accounts.¹ It is based on an examination of 212 prospectus profit forecasts published in 1968 and 1969 and on the annual report and accounts of each company for the two years following its forecast. The data were collected for an investigation into the accuracy of company profit forecasts²; companies whose reported and forecast profits were not comparable (e.g. due to takeovers not allowed for in the forecasts) had previously been eliminated from the data. During the investigation it became apparent that there were some interpretation problems that could have been avoided if the figures had been more clearly defined.

The case for publishing forecasts

The publication of a profit forecast by a company is presumably intended to assist investors and others in evaluating its financial prospects. It has, however, been argued that, because forecasts are 'impossible to verify' on an *ex ante* basis, they are not of much use and that *ex post* comparisons are too late to be of value³. The two parts of this argument will be considered separately.

It is recognised that 100 per cent accuracy cannot be expected due to the uncertainties inherent in forecasting the future. However, the directors of a company are responsible for formulating plans for its future and for directing its operations. In the absence of published forecasts, the main sources of information for the investor are his stockbroker and

the financial press – neither of which can be assumed to be as well-informed on the future plans of the company as its directors – and the annual report and accounts of the company, which mostly give information relating to past achievements. Therefore, it seems plausible that the publication of future plans in the form of a profit forecast, with details of the assumptions used, should be of some use to the investor⁴.

For those who are worried about the integrity of directors in publishing forecasts, there is the safeguard of an independent check on method of compilation in the cases of forecasts issued in connection with mergers and takeovers, and of those included in prospectuses when a quotation for new securities is sought. In the former case, an accountant's report is required by the City Code⁵ and, in the case of prospectuses, Harford, a merchant banker, states that 'the forecast . . . will be carefully vetted by the company's auditors, the accountants reporting to the issuing house and of course by the issuing house itself'⁶. Those reporting on forecasts can be expected to examine budgets and interim accounts prepared for internal use and to take especial care, or to express appropriate reservations, when these are not available.

The *ex post* comparison of actual with budget and the calculation and explanation of variances is common practice within companies using budgetary control systems. Similarly, an *ex post* comparison of reported and forecast profit, giving detailed reasons for any divergence, ought to be helpful as it gives an indication of such matters as the directors' forecasting ability and of the uncertainties and special

¹The author wishes to thank Professor H. C. Edey for his helpful criticism of an earlier draft.

²Susan Dev and Michael Webb, 'The accuracy of company profit forecasts', *Journal of Business Finance*, Vol. 4, No. 3 (1972), pp.26-39.

³Edward Stamp and Christopher Marley, *Accounting Principles and the City Code: the Case for Reform*, London, 1970, p.139.

⁴This point is discussed further in Susan Dev's, 'Mergers and Shareholders', in J. M. Samuels' (ed.), *Readings on Mergers and Takeovers*, London, 1972, pp.163-168.

⁵i.e. *The City Code on Takeovers and Mergers*.

⁶Sir Timothy Harford, 'Pricing a Flotation', *Journal of Business Finance*, Vol. 1, No. 1 (1969), p.17.

events experienced by the company concerned. A knowledge of these should be helpful in assessing its prospects for a further financial period and in interpreting subsequent profit forecasts, if any are published.

The attributes of a good procedure when forecasts are published would seem to be as follows:

- (i) The forecast should clearly state what profit figure is being forecast (e.g. whether it is before or after exceptional items and minority shareholders' interests).
- (ii) The assumptions on which the forecast is based, and the effects on profit of alternative likely situations, should be published.
- (iii) Actual and forecast profits, calculated on the same basis, should be compared later in the annual report and accounts.
- (iv) Detailed reasons for the divergence of actual from forecasts should then be given.

The data for this study will be examined in relation to these attributes, attention being focused solely on profits before corporation tax.

The wording of a prospectus forecast

(a) *Interpretation of the profit figure*

Forecasts are normally included in prospectuses to comply with the Stock Exchange requirement for 'a statement as to the financial and trading prospects of the company'.⁷ There is no guideline or regulation on how the statement is to be presented but the wording of prospectus forecasts is so similar that a common practice seems to have developed. Relevant extracts from a typical prospectus forecast follow:

'Profits, dividends and prospects

As can be seen from the Accountants' Report⁸, the turnover and profits of the group have increased rapidly since 1964 apart from a setback in profits in the year ended 31st March, 1967. This was due to. . . . The Directors expect that, in the absence of unforeseen circumstances, profits of the group, before taxation, for the year ended 31st March, 1971 will be not less than £. . . .'

In a forecast worded as above, the meaning of the phrase 'profits of the group' is not clear. It could refer to the figure that would be reported later as 'net profit before taxation' if the forecast were exactly achieved.

However, as past profits in the Accountants' Report have been referred to in the section in which the forecast is given, it could be taken to mean that the same basis of calculation has been used. The Accountants' Report attempts to give a figure for what might be described as 'normal trading profit'⁹ and this may not be the same as 'net profit before taxation'. Whether the two figures would differ for the period covered by a forecast depends on:

- (1) the definition of 'net profit' to be employed by the company in preparing its accounts for the period;
- (2) the interpretation of 'normal trading profit' that would be placed on the company's figures for the purpose of an Accountants' Report, and
- (3) whether, at the time the forecast is made, items causing (1) and (2) to disagree are expected to occur during the period.

Depreciation is one item that can cause the two profit figures to disagree. The Accountants' Report basis is normally to calculate depreciation on the current values of fixed assets.¹⁰ However, companies do not necessarily record the revised values in their books in which case depreciation in the published accounts would be calculated on existing book values. Also, there are different methods used in practice for reporting certain transactions, especially those that may be described as being of an exceptional or non-recurring nature.¹¹ It may be the company's intention to credit such an item in its profit and loss account but reporting accountants would disallow it in a Report¹² if it were not considered to be part of 'normal trading profit', thereby causing disagreement between the two types of profit.

Of the prospectuses examined, 118 (56%) made reference in the forecast section to the figures given in the Accountants' Report so, at least in these cases, there is an implication that the forecasts were of 'normal trading profit', whatever that phrase might

⁹See The Institute of Chartered Accountants in England and Wales, 'Accountants' reports for prospectuses: adjustments and other matters', recommendation N.16 in *Recommendations on Accounting Principles*, for details of the adjustments to reported profits that might be needed for the purposes of the Accountants' Report.

¹⁰See The Institute of Chartered Accountants in England and Wales, 'Accountants' reports for prospectuses: fixed assets and depreciation', recommendation N.13 in *Recommendations on Accounting Principles*.

¹¹See The Institute of Chartered Accountants in England and Wales, *Survey of Published Accounts 1971-72*, p.21, for statistics showing the various reporting methods used for such items as profits and losses on sales of fixed assets, provisions, prior year adjustments and various non-recurring matters.

¹²i.e. the Accountants' Report. This abbreviation will sometimes be used later in the paper.

⁷The Federation of Stock Exchanges in Great Britain and Ireland, *Admission of Securities to Quotations*, London, 1966.

⁸The Accountants' Report is given to comply with the provisions of the Fourth Schedule to the Companies Act, 1948. Under the Act the Report should normally include, *inter alia*, the profits and losses of the past five years of the company. This is normally extended to ten years, in practice, to comply with a Stock Exchange requirement.

mean. Throughout this paper, it will be assumed that only these 118 forecasts were of 'normal trading profit' as the remaining 94 (44 per cent) companies did not indicate that this was the meaning of the figure they were forecasting.

(b) *The treatment of minority shareholders' interests*

Another *ex ante* interpretation problem concerned the treatment of minority shareholders' interests in the profits of subsidiary companies. 41 (19%) of the companies included in the study had outside shareholders yet, in 16 cases, there was no mention in either the Accountants' Report or the prospectus forecast whether their share of profits had been deducted in arriving at the profits of the group before taxation. The forecasts of 24 companies were taken to be after deduction of minority interests. In some of these cases, however, there was merely an implication that this was the correct interpretation for, in the forecast section, profits in the Accountants' Report for earlier years were referred to and, in the Report, profits had been shown as being after deduction of minority interests. The remaining company explicitly stated that its forecast was of profits before deduction of minority interests.

(c) *Some opinions*

Three officials of different organisations closely concerned with prospectus profit forecasts were asked for their interpretations of the normal wording used in forecasts. Extracts from their replies follow:

- (1) 'As to the form in which forecasts appear it is common practice for profits to be defined "after all charges and before taxation". This is the way the profits will normally have been set out in the Accountant's Report and it is to be expected that a forecast would be similarly defined. . . . It should be clear from the context in which the trading prospects of the company are dealt with whether there is included in the forecast any exceptional or non-recurring items. Minority interests are essentially below the line adjustments¹³ and would not be deducted in either the Accountant's Report or the forecast.'
- (2) 'I would suspect that different companies tend to place different interpretations on the phrase "profit before taxation". . . . In general, I think it would not be unreasonable to assume that the phrase usually means the profit which the company expects to report before exceptional items and before the deduction of minority interests.'

¹³i.e. given further down in the profit and loss account than the figure for 'net profit for the year before corporation tax'.

- (3) 'In my view, profits before taxation would normally mean the expected reported profit in the next accounts. If there were to be any significant exceptional items I should expect them to be referred to and discussed separately. . . . Similarly, one would expect minority interests, if significant, also to be dealt with separately.'

There seems to be no clear-cut consensus of opinion on what the phrase means.

Statement of assumptions

In none of the prospectuses examined was a statement of assumptions used in compiling the profit forecast given. Until the revised City Code was published in April 1969, a statement was not required in the case of forecasts issued in connection with proposed mergers and takeovers. As some reporting accountants, and other advisers, are concerned with prospectus forecasts as well as with merger and takeover forecasts, it is to be expected that some might voluntarily provide a statement of the assumptions used in compiling prospectus forecasts. An examination of 91 prospectus forecasts issued between May and December 1972 shows that only 16 (18%) were accompanied by statements of assumptions and these were of varying degrees of usefulness.

It seems to be a weakness of statements issued in connection with proposed mergers and takeovers too, that the effect on profit of particular assumptions not holding is omitted where it would not be unreasonable to expect this information. An example of an acceptable assumption according to the City Code (practice note No. 6) is 'the current national dock strike will not last longer than six weeks'. The assumption would be more useful if the expected effect on profit if the strike lasted, say, one more week, or one less, were given.

Comparison of actual with forecast profit

(a) *Reference in the annual report and accounts*

If a prospectus forecast is referred to, it is nearly always in the chairman's statement, which is non-statutory and not covered by the auditor's report. In 47 (22%) cases, there was no reference at all to the prospectus forecast, thus implying that the chairmen considered that comparison of actual and forecast profits was of no interest to shareholders and other readers of the accounts. In 46 (22%) cases, reference was made to the fact that the forecast was either exceeded or not achieved, as appropriate. For the remaining 119 (56%) companies, numerical comparisons were given, generally in the following form: 'Net profit for the year amounts to £x compared with the forecast in the prospectus of £y.' By examining these

companies' annual accounts for what has been allowed for, or credited, in arriving at the figure of £x, it is possible to get some idea of whether the earlier forecast was, in fact, of 'normal trading profit' or of 'net profit before taxation' and whether, in the case of groups of companies, it was before or after deduction of minority shareholders' interests.

(b) *Selected items apparently allowed for in the forecasts*

It is assumed in this study that the reported and forecast profits compared by the chairmen of the 119 companies mentioned above were, in fact, calculated on a comparable basis. For example, if a company charged a loss on sale of fixed assets to reserve, or included an item of exceptional expenditure below the line, in its published annual accounts, it was assumed that, if their existence were known or foreseen when the forecast was published, they were similarly not charged in arriving at the forecast profit figure.

Table 1 gives some information extracted from the accounts and prospectuses of the 119 companies. The first column gives the number of companies that allowed, in their published profit and loss accounts, for the items listed and, therefore, apparently in their prospectus forecasts too. The second column indicates how many of the companies in the first column implied that their forecasts were of 'normal trading profit'.¹⁴

The first row of the table shows that 15 of the 119 companies disclosed profits or losses on sales of fixed assets in their profit and loss accounts and a further 21 carried them to reserves. As the prospectuses did not mention these items, it was not possible to guess earlier when interpreting the forecasts how they would be reported or, indeed, whether they were expected to arise at all. Nine of the 15 companies implied that their forecasts were of 'normal trading profit' so the profits in the Accountants' Report for earlier years must have included profits and losses on any sales that arose either because they were considered to be normal or because they were immaterial in value. Similar interpretations can be given to the other rows of the table.

It can be suggested that the comparisons made by the chairmen of some companies included in the table were at least unhelpful. For example, the chairman of the company in the eighth row of the table pointed out that the reported profit before tax (£201,000) exceeded the forecast (£172,000), yet the former figure had been achieved after crediting an overprovision for advertising of £10,000. In the prospectus, it was explicitly stated that the Accountants' Report basis had been used in compiling the forecast. It seems im-

¹⁴It should be recognised that these are some of the 118 companies that referred to the Accountants' Report figures in giving their forecasts.

TABLE 1

Selected items apparently allowed for in the profit forecasts of 119 companies

| <i>Nature of item</i> | <i>1. Allowed for in forecast Number of companies</i> | <i>2. No. of companies in 1. that apparently forecast 'normal trading profit'</i> |
|---------------------------------------|---|---|
| Profit or loss on sale of: | plus: | |
| Fixed assets ¹ — disclosed | 15 (21 in reserves) ³ | 9 |
| not disclosed | 89 ² | 46 |
| Investments | 1 (10 in reserves) | 0 |
| Proportion of investment grants | 61 (3 in reserves) | 36 |
| Exceptional items: | | |
| Interest | 1 | 0 |
| Devaluation adjustment | 1 | 1 |
| Others (no details) | 1 | 1 |
| Prior year items: | | |
| Over-provision for advertising | 1 | 1 |
| Investment grant | 1 | 0 |
| Audit fee | 1 | 0 |
| Directors' remuneration | 1 | 0 |
| Depreciation | 1 | 0 |

¹ The profits and losses on sales of fixed assets total to more than 119 as, in some cases, profits or losses on more than one type of fixed asset arose and were treated differently in the accounts.

² In 89 cases, the schedules of fixed assets indicated that disposals had taken place but the profits or losses were not separately disclosed.

³ See text. These are additional companies that, in their annual accounts, carried the items indicated to reserves.

probable, however, that even if the £10,000 had been credited in the forecast, it would have been credited in an Accountants' Report. To include it in the forecast without explanation could be expected to lead investors to be over optimistic about the prospects of the company.

(c) *Profit for the year preceding the forecasts*

Suppose that a company issues a profit forecast of £100,000 for the year ended 31 December, 1969; suppose also that it implies that the Accountants' Report basis has been used in the forecast (i.e. so that the forecast is of 'normal trading profit') and that the Report shows that the profit before taxation for the previous year was £90,000. It appears that the figures are comparable. When the 1969 annual report and accounts are published, suppose that the reported profit is £110,000 and that the comparative figures in the profit and loss account show that £90,000 was earned in 1968. One knows from the wording of the forecast that it was probably of 'normal trading profit' and, because the comparatives and the Accountants' Report figures agree, one is fairly confident after the results are published that the forecast and reported

profit figures were prepared on a comparable basis.¹⁵ One can say that the 'follow through' process is almost complete. If the chairman expressly compares the forecast and reported profit one's confidence is even greater as the 'follow through' is complete.

What, however, is the position if, instead, the comparative figures differ from those in the Accountants' Report, apparently due to the use of different reporting methods? In interpreting the forecast at the time it is published, the position is no different but after the results are published one may well doubt whether one's earlier interpretation of the prospectus forecast was the one intended by the company, particularly if the figures in the Report and comparatives differ significantly.

Table 2 shows that what has been described as the 'follow through' process was complete in only 17 cases and almost complete in a further 14 (i.e. 31 less 17). It also shows that 57 companies implied in their

¹⁵One might, however, revise one's earlier opinion that the Accountants' Report basis had, in fact, been used if exceptional or prior-year items are found to have been charged, or credited, in arriving at the relevant reported profit figure.

TABLE 2

Relationship between the apparent use of 'normal trading profit' in prospectus forecasts and agreement of Accountants' Report and comparative figures in next annual accounts

| Did Report and comparatives agree? 'normal profit' forecast? | Yes | No | Not comparable ² | Total |
|---|----------------------|----------|-----------------------------|-----------|
| | Number of companies | | | |
| Yes | 31 (17) ¹ | 57 (31) | 30 (12) | 118 (60) |
| Don't know | 23 (15) | 43 (25) | 28 (19) | 94 (59) |
| Total | 54 (32) | 100 (56) | 58 (31) | 212 (119) |

¹ The figures in brackets refer to those cases where the chairmen made numerical comparisons of reported and forecast profits.

² Of the 'not comparable' cases, 36 did not disclose comparatives in their next annual accounts for various reasons. For the remaining 22 the comparatives and the Report covered different accounting periods or different companies in the group.

TABLE 3

Deviations of profit given as comparatives in next annual accounts from Accountants' Report figures for same period

| Absolute deviations 'Normal profits' forecast? | Yes | Don't know | Total |
|---|---------------------|------------|----------|
| | Number of companies | | |
| % | | | |
| 0-2.4 | 25 (8) | 18 (6) | 43 (14) |
| 2.5-4.9 | 12 (7) | 11 (10) | 23 (17) |
| 5.0-7.4 | 7 (6) | 3 (2) | 10 (8) |
| 7.5-9.9 | 5 (5) | 6 (4) | 11 (9) |
| 10 and over | 8 (5) | 5 (3) | 13 (8) |
| Total | 57 (31) | 43 (25) | 100 (56) |

prospectuses that their forecasts were of 'normal trading profit' yet the figures given for comparative purposes in the next annual accounts differed from those in the Accountants' Report for the same period. Of these 57 companies, the chairmen of 31 had compared reported and forecast profits in their annual statements.

Table 3 shows the percentage deviations of comparatives from the Accountants' Report figures of profit for the year preceding the forecast for the cases given in the second column of Table 2.

As can be seen from the table, the deviations were, by no means, all insignificant in size and they arose as frequently for companies that implied that the Accountants' Report basis had been used in their forecasts as for the companies that gave no indication of the basis used. Normally, depreciation charged in arriving at the net profit figure in the Accountants' Report is noted in the Report. It was obvious when comparing the charge in the Report with the figure given in the comparatives that depreciation was frequently at least part of the reason for the divergence. It was explained earlier that this can often be a cause of disagreement between 'normal trading profit' and 'net profit before taxation'.

(d) *Prior year items*

All items relating to the forecast year will not necessarily be reported in that year's accounts if their effects on profit – or their existence – is not known at the time the accounts are prepared. An examination of the annual accounts for the year subsequent to that of the forecast can indicate whether such items have occurred. To make a meaningful comparison of reported and forecast profits, the reported profit for the forecast year should be adjusted for prior year items reported in the next year's accounts even if they were not foreseen at the time the forecast was published.

Twenty-six companies disclosed prior year items in their next accounts (i.e. those for the year after the forecast year). The nature of the items for six companies was not disclosed but the rest referred to a variety of items such as insurance claims, audit fees,

bad debts, depreciation, losses of subsidiary companies and investment grant claims. A further six companies had changed their accounting methods and had adjusted reserves for the effect of the changeover. Of these, three altered their methods of stock valuation.

(e) *Minority interests*

Table 4 deals with the treatment of minority interests in the prospectus forecasts. It compares an interpretation of their treatment from examining the wording of the forecasts, as already explained, with an interpretation after reading the chairmen's statements in the annual reports and accounts. The table indicates that eight prospectuses seemed to imply that the forecasts were after deduction of minority interests yet the chairmen compared reported profits, before their deduction, with the forecasts.

Most likely some of these discrepancies can be accounted for by a faulty interpretation of the forecast which adds weight to the evidence that prospectuses are often not easy to interpret due to lack of definition. However, it does appear that some were rather misleading. For example, one forecast expressly stated that it was of group profits after deduction of the proportion attributable to minority shareholders yet the chairman compared the reported profit before taxation, and before the deduction of minority interests, with the forecast.

Reasons for divergence of actual from forecast profits

In only 25 of the 212 cases did the chairmen give any explanation for the reason why the forecasts were exceeded, or not achieved. The most common explanation was that sales were either lower or higher than anticipated at the time of the forecast. Other reasons for divergences included the weather, rising costs, reorganisation, labour troubles, bad debts and Government measures.

Conclusions

This paper has attempted to indicate that the definition of profit used in prospectus forecasts has, in

TABLE 4

References to whether forecast profits were before or after allowing for minority interests in subsidiaries

| <i>In chairman's statement</i> | <i>Before</i> | <i>After</i> | <i>No mention</i> | <i>Total</i> |
|--------------------------------|----------------------------|--------------|-------------------|--------------|
| <i>In Prospectus</i> | <i>Number of companies</i> | | | |
| Before | 0 | 0 | 1 | 1 |
| After | 8 | 6 | 10 | 24 |
| No mention | 9 | 1 | 6 | 16 |
| Total | 17 | 7 | 17 | 41 |

general, not been clear either at the time of the forecast or, later, when a comparison of the forecast with subsequent reported results was possible. If prospectus, and other, forecasts are to serve their intended purpose, it seems essential that the figures be clearly defined, otherwise the investor who uses the forecast to get some indication of future prospects, might well be misled if he is not informed of what has, and has not, been allowed for in the forecast. In addition, a statement of assumptions on the lines of those accompanying forecasts issued during proposed mergers and takeovers seems highly desirable.

It seems to be a weakness of a forecasting system that the forecasts are vetted by independent experts, yet there is no outside check that a comparison of the reported and forecast profits has been correctly made and explained in the subsequent annual report and accounts.

It would appear that these points deserve the attention of organisations and professional bodies concerned with profit forecasts included in proposed merger and takeover documents as well as those given in prospectuses.

The Role of the Auditor in Modern Society: an empirical appraisal

G. W. Beck

After more than a decade of concerted criticism, auditors in Britain, the United States and Australia could be expected to be particularly interested in an evaluation of their social role. In broader perspective every user of information upon which the auditor reports should be similarly interested, for an awareness of the role is prerequisite to rational use of the information. In view of this situation David Flint's recent 'exploratory essay'¹ is especially apposite. Early in the essay he poses the question: 'What is the role of the auditor in modern society?' and observes that 'there is no evidence that this issue is the subject of serious consideration and research.'² Since 1970, a significant research programme has been in process in Australia concerned with an evaluation of the role of the accountancy profession with particular emphasis on the role when public accountants act as auditors. This research is now nearing completion and it is suggested that the findings are relevant for Britain and, perhaps, for the United States as well. The social (and particularly legal) environments in Britain and Australia are essentially similar and, although there are notable legal differences between company legislation in the United States and that in force in Australia, the overall social environments are not dissimilar. However, it is obvious that empirical research findings in Australia can only be considered totally valid for Australia and the results subsequently discussed must be interpreted in that light.

Roles

Katz and Kahn assert that the concept of role 'is at once the building block of social systems and the summation of the requirements with which the system confronts the individual member.'³ Although

their context was that of organisations, their assertion appears capable of generalisation to encompass the total social organisation, i.e. society as a whole. They are quick to point out that the concept has proved difficult for social scientists since Linton⁴ first gave it a central place in any social science, and refer to the 'justifiable disenchantment by writers who combed the literature seeking in vain the research fulfilment of [the] conceptual promise'.⁵ Two writers who surveyed the social science literature very carefully came to the following conclusion in 1951:

'The concept of role is at present still rather vague, nebulous, and non-definitive. Frequently in the literature, the concept is used without any attempt on the part of the writer to define or delimit the concept, the assumption being that both writer and reader will achieve an immediate compatible consensus.'⁶

The difficulty that social scientists have experienced in developing a clear concept of role has a message for those members of professions concerned with professional roles; but writers in the academic and professional accounting literature seem not to appreciate the difficulty and no attempt has been made to set out what the concept means for them. The plethora of ill-defined concepts that presently exists in accounting is troublesome enough without adding yet another; it is therefore necessary to discuss the concept adopted, and the reason for its adoption, before proceeding to an evaluation of the role of auditors.

Even in ordinary English usage 'role' does not mean simply what one does; nor does it mean the total of all the activities that one embarks upon. The Shorter Oxford English Dictionary defines 'role' as

¹David Flint, 'The Role of the Auditor in Modern Society: An Exploratory Essay', *Accounting and Business Research*, Autumn 1971, pp. 287-293.

²*Ibid.*, p. 287.

³D. Katz and R. L. Kahn, *The Social Psychology of Organisations* (New York, John Wiley & Sons Inc., 1966), p. 171.

⁴Ralph Linton, *The Study of Man* (New York, D. Appleton-Century Co., 1936).

⁵Katz and Kahn, *op. cit.*

⁶Lionel J. Neiman and James W. Hughes, 'The Problem of the Concept of Role - A Re-survey of the Literature', *Social Forces*, XXX (1951), p. 149.

'the part which one undertakes, assumes, or has to play.' There is here the notion of imposition; self-determination of the limits of the undertaking is not possible once the part is assumed. Linton, in a social science context claimed, in 1936, that 'A role represents the dynamic aspects of status . . . when [the individual] puts the rights and duties which constitute the status into effect, he is performing a role.'⁷ He slightly altered this definition subsequently and described a role as 'the sum total of culture patterns associated with a particular status' and elaborated by pointing out that it consists of 'attitudes, values and behaviour ascribed by the society to any and all persons occupying this status.'⁸ Many subsequent writers in the social sciences adopted Linton's definition of role (sometimes with minor modifications) and it is here put forward as an acceptable concept for writers in accounting literature concerned with professional roles. The role of an auditor is thus the 'set' of attitudes, values and behaviour that society ascribes to all individuals occupying the status of auditors.

However, in addition to recognising roles, cognisance has to be taken of the pressures for role conformity. It is suggested that, in the long run, such pressures are irresistible. In this regard the contention of Katz and Kahn is endorsed: 'The person in a social system who plays a role is under the demands of that role to act in many of the ways that he does.'⁹

Adoption of this concept of role leads inexorably to the view that the individual cannot determine his own role; nor can he limit his role. But this view cannot, of course, be extended to a statement that every individual fully performs his allotted role. If the ascribed role is not fully performed – and the results of the research in Australia indicate that this appears to be so in the case of auditors – there arises the possibility that social action will be taken to enforce conformity (perhaps by new legislation) or to downgrade the status and thus shrink the role. As a role develops only out of social wants, it is axiomatic that the void created by a reduced role will, in due course, be filled by other social functionalities prepared to satisfy those social wants.

A consideration of role development over time is an interesting aspect worthy of extended treatment, but it is relevant here only to the extent that it is further explication of the concept of role. For this reason only brief reference will be made to it.

The appearance of specialist economic groups in society is an understandable response to human

economic wants and to the desire to maximize the use of available resources. A changed social environment or a technological advance may cause wants to develop for certain economic goods or services. Individuals offer to satisfy these wants and, over time, individuals engaged in satisfying similar wants might become numerous enough to join in professional, trade or other association. The similarity in the economic activities that the individual members have been performing becomes the element that makes association meaningful. However, once association has occurred there develops, again over time, a social consciousness that a certain group exists and that it makes a particular type of contribution to the functioning of society. Put briefly, society at first recognises service functions and then assigns a role to each of the specialist associations which came into being in the first place because of the similarity of the services offered by their members.

This, of course, can appear to be a chicken-and-egg argument: what comes first, the socially-ascribed role or the activities of the individual members which, at least in part, determine the role? However, an inductive appraisal of the environment proscribes a view that the argument is merely of this order. Similarity of economic activities amongst individuals prompts association, but it does not alone determine the role that society will ascribe to a particular association once formed.¹⁰ The role ascribed is a direct outgrowth of the social consciousness that develops concerning what an association does, what it stands for and where it fits in the total social order. The role assigned may be unrealistic, over-burdensome or otherwise inequitable and, in the view of those charged with carrying it out, inappropriate. Under these circumstances the rational procedure is for the members of an association (such as a professional group) to embark on a campaign to educate outsiders in the hope that the role can be amended. However, role amendments undertaken by professional groups could be expected to be long-term projects.

It follows from the above consideration that the phrase 'the role of the auditor' means the 'set' or collection of attitudes, values and behaviour ascribed by society to an individual because he is a member of an organized professional body of auditors. The phrase should be interpreted in this way henceforth in this paper. The determination of the concept of role was, of course, an essential pre-requisite to an

⁷Linton, *op. cit.*, p. 114.

⁸Ralph Linton, *The Cultural Background of Personality* (New York, D. Appleton-Century Co., 1945), p. 77.

⁹Katz and Kahn, *op. cit.*, p. 49.

¹⁰As Katz and Kahn point out, 'Roles . . . develop originally from task requirements' (*op. cit.*, p. 37). It is clear that although roles develop this way *originally* new tasks which members of professional groups perform do not *automatically* alter their assigned role and may, in fact, never alter that role even when the tasks are seemingly acceptable extensions of the role.

empirical research programme to assess the auditor's role; it was necessary to decide precisely what was to be assessed.

The research method

If, as accepted above, a role consists of the attitudes, values and behaviour ascribed by society, it follows that a role is determined by the total social consensus. As a total social consensus can only be appraised by a process such as a general election – and then only in respect of a narrow social view – determination of the total consensus is not a feasible research objective. Logically, then, an attempt to discern a role has to be restricted to the sampling of a representative cross-section of society. Even this procedure seemed to be quite futile as a means of evaluating auditors when the concern was primarily with the role of auditors as professional functionaries. However, it is suggested that, had the concern been to assess the image of the individual auditor, such a sampling would have been mandatory.

Many people have had no direct contact with auditors or their work and it would seem pointless to ask them to express an attitude to the services rendered by auditors. It was therefore decided to sample people who it was known had at least been exposed to accounting statements reported on by auditors and who, because of a financial stake, could be expected to have some interest in the affairs of at least one company. One thousand names were selected at random from each of the share registers of two major Australian companies, one in mining and one in retailing. These companies had just under 80,000 and 50,000 shareholders respectively and the holdings were very widespread. After companies, societies and overseas shareholders were eliminated from the samples there remained 1,561 individuals to whom forms were sent. The usable responses totalled 711 or 45.5 per cent.

The forms despatched consisted of 32 assertions about accountants with which the respondents were asked to strongly agree, agree, disagree, disagree strongly or to indicate that they were uncertain. Fifteen of these assertions were concerned with accountants acting as company auditors. Some demographic information was also obtained and one question asked for a status-ranking of accountants compared with other professionals. It is recognised that there are weaknesses in presenting respondents with assertions and seeking their agreement or disagreement. It is, for example, possible that those who are uncertain will simply agree despite the fact that provision is made for them to indicate their uncertainty. But there are advantages in this form of survey too; for a disagreement with an assertion

is unequivocal. It is therefore possible to place considerable reliance on the import of a significant proportion of disagreements when they appear in the frequencies.

The research results

The appendix to this paper sets out the assertions and the frequencies of the responses obtained. Reference to the appendix will, I believe, bring agreement that the professional services that the shareholders in the samples expect from auditors are in several respects wider and more onerous than most auditors would consider it reasonable, or even possible, to provide.

I doubt if there will be surprise that 94 per cent of respondents would buy shares in a public company only if it is audited (Statement 1) and that 96 per cent expect the auditor to be completely independent of management (Statement 2). Responses to the assertions regarding the assurance that shareholders derive from the work of the auditor, however, may disturb those engaged in this work. These responses are summarised against Statement 3(a) to 3(g) inclusive and it should be noted that the assertion here relates to the work of the auditor and not to his report. I doubt if the wording of audit reports (at least reports of the kind given to Australian and British shareholders) has any significant impact on the recipients of the annual accounts of companies. Regardless of this aspect, my concern was to discern the nature of the assurance that shareholders think they obtain as a result of an audit having been carried out. The high percentages of people who expect to find the accounting statements reliable, that there have been no frauds, and that management has discharged all statutory duties (3(a), (b) and (e) respectively) were predictable. The high percentages who expect an assurance that the accounting system is *effective* and that it has been operating *efficiently* (3(c) and (d) respectively) were not predictable, but they were not completely unexpected. The 71 per cent of respondents who expect assurance that management is efficient (3(f)) and the 81 per cent who expect that the audit gives a basis for considering a company to be financially sound (3(g)) have provided some disconcerting information. The implications for auditors flowing from such a large proportion of the sample obtaining erroneous assurances from the statutory audit report are quite serious. The role that these people see the auditors assuming is clearly very much wider than that fulfilled by careful performance of the audit requirements of the company legislation.

The high proportion of shareholders expecting assurances of this kind is consistent with the 71 per

cent (Statement 4) who want the auditors to take active steps to look after their interests. All auditors, and most accountants, know how difficult it would be to act in the manner expected by this significant majority. Indeed, even some of the sample respondents seem to have wavered when asked to indicate whether they want to give the auditor authority over management in matters pertaining to the accounting treatment of business transactions (Statement 5). Fifty-five per cent want him to have this authority, but those against now total 32 per cent compared with 25 per cent who disagreed with Statement 4. I expected the frequencies for Statements 4 and 5 to be similar but they are not as close as anticipated. It seems that some shareholders do not realise that looking after their interests includes ensuring that management does not put the best accounting light on the results of a company's transactions. There is, of course, still a substantial margin of respondents who want the auditor to have this authority, and auditors may find this result useful evidence in considering the possibility of adopting a stronger line, especially with public company managements.

Statement 8 in the appendix is concerned with auditors acting as company directors and the results appear to indicate that respondents did not hesitate to disagree with assertions put to them. The frequencies are almost identical for proprietary and public companies and a large majority see nothing wrong with auditors accepting directorships in companies they are not auditing. The implications here are that shareholders consider auditors to have knowledge and expertise that fits them for directing the affairs of companies, and further, that they do not see dangers of conflict of interest that might have caused them to respond differently. I expect that those public accounting firms which do not permit principals to accept directorships will find this response enlightening.

Statements 6 and 7 do not require consideration in a discussion of roles, but Statement 7, which is concerned with an auditor owning shares in client companies, resulted in an interesting response when compared with the response to Statement 2. In Statement 2 there was an emphatic view expressed that the auditor should be completely independent of management. In contrast with the strong belief in this regard, shareholders are not nearly as concerned that an auditor should be completely disinterested in a client company. Thirty per cent of respondents saw nothing wrong with an auditor owning shares in a company he is auditing and 9 per cent were uncertain of their view. This response is a significant dissension from the assertion put to them and is in accord

with the attitude displayed in other responses. Many shareholders expect an auditor to take steps to look after their interests (see Statement 4) and it is not unlikely that a proportion of shareholders responding in this way to Statement 4 thought that the auditor was more likely to do this if he had similar interests arising from a direct shareholding.

The discerned role

'In order to demonstrate what "society" or a "group" expects, we must ask its members what they expect.'¹¹ The procedure adopted with the Australian shareholders (representing 'society') differed to the extent that they were asked to agree or disagree with assertions; but for all practical purposes the expectations of shareholders have been canvassed. What can be said about the role that emerges?

First of all the auditor is expected to lend credibility to the accounting statements provided by management to shareholders. But, additionally, the auditor's report is expected to provide assurances about the company itself and about company officials. For example, a large majority of shareholders assumed that the presence of an unqualified audit report on company accounts (which is the overt evidence of the work that the auditor has carried out) means that the accounting system is effective, that it is operating efficiently and even that the company is financially sound. Very large majorities expected that such a report gave assurance that company management and personnel had functioned honestly and had discharged all duties imposed by statute. A quite significant majority expected it to indicate that management was efficient. It is obvious that many respondents in the samples expect the auditor to make subjective assessments about the way the management group is running a company and about the managerial actions of individuals in the company. In the light of such expectations a report on the truth and fairness of the view given by a balance sheet and profit and loss account appears to be a quite inadequate performance of the ascribed role.

Most auditors would probably consider that the following statement is an adequate description of their role:

'Company auditing is concerned with the creation of belief and confidence in the financial accounting information which describes the use made of economic resources within a company over a stated period of time. By giving an expert and independent opinion upon the company's annual

¹¹Neal Gross, Ward S. Mason and Alexander W. McEachern, *Explorations in Role Analysis: Studies of the School Superintendancy Role* (New York, John Wiley & Sons Inc., 1964), p. 5.

financial accounts, the auditor attests to the latter's credibility on behalf of the shareholders who rely upon this formal substantiation taking place, prior to making use of the information in their investment management activities.¹²

This view may also be considered to express the attitude that has been reflected in the English and Australian company law. The auditor has, under the law, been required to act as an intermediary between those in managerial control of companies and those who obtain information about the companies from the accounting reports. To this end the auditor has been called upon to satisfy himself that the accounting reports provide a true and fair view and to make an assertion to this effect in his report. Although recent amendments to the company law in the eastern States of Australia have not significantly altered what the auditor is required to say in his report, some provisions of the Companies Acts in these States do exhibit a changed character and Australian auditors will in future be called upon to police certain requirements of the law. But this is new legislation; it is fair to say that to date the auditor has simply been required to attest to the credibility of the accounting statements.

The professional groups appear to have seen the role of the auditor as no more than 'to secure to the shareholders independent and reliable information respecting the true financial position of the company at the time of audit.'¹³ Both the Institute of Chartered Accountants in England and Wales and the Institute of Chartered Accountants in Australia have issued official Statements on auditing.¹⁴ Careful reading indicates that no Statement contains evidence that a wider role is envisaged than that which is implicit in the above words of Lord Justice Lindley uttered nearly 80 years ago.

The shareholders sampled see very much more to the role of the auditor. He is not merely an intermediary lending credibility to certain information; he is, at least to some extent, a protection against certain inefficiencies and managerial malfunctions.

Perhaps it is not possible for auditors to function in a way that would enable them to fulfil the role indicated by these expectations. But I doubt whether many (or any) auditors realise how much closer their

role is, in the eyes of shareholders, to that of a policeman than it is to that of a reporter on a state of affairs. As society becomes more conscious of aspects such as the social responsibilities of business – and such increased consciousness seems inevitable – it is likely that the 'protective' aspects of the role of the auditor will become more apparent. It might be wise for the profession to take cognisance of the present situation with a view to determining a rational attitude to it and to likely developments in the future.

Conclusion

This paper is a consideration of the concept of a professional role and a report of the results of an empirical research programme aimed at role evaluation. It is not concerned with putting forward a case for different action by auditors. The professional body of auditors must decide for itself how best to perform the role that society assigns to it as a result of the place the profession has in the total social order. It is, however, vital that auditors make themselves aware of that role. It is ascribed by society and cannot be easily modified by the professional group. Failure to perform the role is almost certain to bring action from society eventually; there will be either attempts to force the professional group to assume the full role or a removal and reassignment of part of the role to other social functionaries.

The relocation of some aspects of role must result in a change in social status of the group whose role has been diminished. In fact this change may not be a reduction, but, in the context of professional groups which grow out of the wants of society for certain specialist services, it is difficult to envisage a situation in which a reduction in status would not occur. If the members of society for whom auditors are primarily acting expect auditors to tell them, for example, whether a company is financially sound and whether management is efficient, they obviously consider this information useful in their decision-making processes. If auditors do not provide the information it is reasonable to assume that it will be sought from other sources. It may be doubtful whether any other credible source can provide information of this kind: but auditors certainly should be aware that it is wanted and that a significant proportion of shareholders expect auditors to supply it.

Concern for the role ascribed to auditors must, of course, be an extension of a belief that, in the long run, the public will prevail. The profession of auditors must be seen to possess considerable economic power, albeit indirectly, for in the absence of a functioning auditing profession the economic

¹²T. A. Lee, 'The Nature of Auditing and Its Objectives', *Accountancy*, April 1970, p. 292.

¹³L. J. Lindley, *In re London and General Bank* (No. 2), (1895), p. 682.

¹⁴The Statements which are of particular relevance to a consideration of roles are: Institute of Chartered Accountants in England and Wales, *Statement on Auditing No. 1* (16 August 1961) and Institute of Chartered Accountants in Australia, *Statement on General Principles of Professional Auditing Practice* (October 1969).

structure in countries such as Britain, the US and Australia would be different and the corporate organisation would vanish. The following observations of Adolf A. Berle are thought to apply to auditors no less than to those with the obvious economic power to manipulate resources of corporations and about whom the comments were made:

'We have considered public consensus, if not as originator, certainly as final arbiter of legitimacy. We have suggested that this consensus has set up, and more or less continuously develops, criteria by which the actions and results of economic power, and

the men who possess it, are currently judged.'¹⁵

It seems reasonable to view the public consensus concerning the role of the auditor as also in a state of continuous change or development; but, generally speaking, there is small likelihood of sudden or dramatic change in this consensus. Consequently, it is suggested that the results of the appraisal obtained from more than 700 Australian shareholders can be taken as reflecting the extant role of the auditor.

¹⁵Adolf A. Berle, Jr., *Power Without Property* (London, Sidgwick & Jackson Ltd., 1960), p. III.

Appendix

RESPONSE FREQUENCIES TO ASSERTIONS MADE ON SURVEY FORM

| | % <i>Agree</i> | % <i>Disagree</i> | % <i>Uncertain</i> |
|--|-------------------|----------------------|-----------------------|
| 1. You would buy shares in a public company only if it was audited | 94 | 3 | 2 |
| 2. You expect the auditor to be completely independent of management | 96 | 2 | 1 |
| 3. You expect the work of the auditor to give you assurance that: | | | |
| (a) the company's accounting statements are reliable | 98 | 0 | 1 |
| (b) there have been no frauds perpetrated by company officials | 93 | 5 | 1 |
| (c) the accounting system is effective. | 96 | 1 | 2 |
| (d) the accounting system has been operating efficiently | 93 | 4 | 2 |
| (e) management has discharged all statutory duties (e.g. under the Companies Act) | 92 | 3 | 3 |
| (f) management is efficient | 71 | 23 | 5 |
| (g) the company is financially sound | 81 | 14 | 4 |
| 4. You expect the auditor to actively look after the interests of shareholders, e.g. by seeing that actions of management appear to be in the shareholders' interest | 71 | 25 | 3 |
| 5. You want the auditor to have authority to specify the accounting treatment of company business transactions | 55 | 32 | 11 |
| 6. You expect the auditor to be a member of a professional accounting society as evidence of his competence | 93 | 5 | 2 |
| 7. You want the auditor to avoid owning shares in the company he is auditing | 57 | 30 | 9 |
| 8. You would refuse an auditor permission to: | | | |
| (a) act as a director of a proprietary company he is not auditing | 15 | 72 | 9 |
| (b) act as a director of a public company he is not auditing | 14 | 74 | 8 |

(The difference between 100 per cent and the total of the percentages shown for 'agree', 'disagree' and 'uncertain' represents the percentage respondents who did not indicate their attitudes.)

Measurement of Divisional Performance: A Comment and an Extension

Michael Bromwich

In a recent article in this journal¹ John Flower made the point that some techniques used to monitor the past performance of divisional management may cause decisions to be taken that do not lead to the maximisation of profits (which in this article is assumed to be equivalent to maximising the discounted value of the enterprise). This effect may occur when short-run performance measures yield different signals as to the profitability of a project or division than do investment appraisal models based on discounted cash flow analysis. Given such a divergence, divisional management when selecting investment projects may opt for those giving good short-run performance at the expense of long-term profitability. This behaviour may occur because good short-term performance is thought to have a more immediate effect on the view held by top management of subordinates' efficiency.

Flower suggests a class of short-term performance measures which yield periodic signals consistent with the discounted cash flow models used for investment planning in that they lead to the same decisions.

The suggested technique entails preparing annual profit and loss accounts incorporating an interest charge on the capital assets committed to divisional management and using a depreciation method that produces irregular annual charges which cannot be computed in any simple way. Further, the method involves recognising unrealised profits in internal reporting. Flower implies, perhaps for these reasons, that it is unlikely that many businessmen will implement the method even though, in his view, 'this (method) would seem to be an ideal method of control'.

One purpose of this article is to suggest that the proposed control system is not really ideal because, even abstracting from the difficulties mentioned by Flower, it cannot be made operational in the practical

world. An explanation of this point requires a brief examination of the income concept associated with discounted cash flow models. This is the purpose of the next section of this article. The results obtained are then used to examine the validity of Flower's claims for his method. The following section assesses Flower's assertion that he has shown that the residual income measure is the long-run analogue of the net present worth concept. The final sections examine the controversial question of whether interest charges should be incorporated in measures of short-run performance and suggest a new way of looking at the problem.

The income concept associated with discounted cash flow models

There exist many definitions of the income or profit² for a period. Most attempt to measure the increase in wealth that has accrued to the firm's owners over a specific period. One such definition has obtained considerable acceptance amongst, at least, economists and academic accountants. This says that income is the amount that could be paid out during the period to those whose welfare is in mind, normally the shareholders, in the expectation that they will be as well off at the end of the period as they were at the beginning.³ This definition assumes no changes to the firm's financing during the period.

This concept of income can be used to derive income measures for each future year of a project's or firm's life that are consistent with discounted cash flow models. The present value model will be taken as an example using the cash flows of Flower's

²For a discussion of some of these, see E. S. Hendriksen, *Accounting Theory* (R. D. Irwin, Homewood, Illinois, 1968), Ch. 5.

³The original definition was proposed by Hicks: "A person's income is what he can consume during the week and still expect to be as well off at the end of the week as he was at the beginning". J. R. Hicks, *Value and Capital* 2nd edition (Clarendon Press, 1946), p. 179.

¹J. F. Flower, 'Measurement of Divisional Performance', *Accounting and Business Research*, Summer 1971.

project A. This yields forecast net cash inflows of £25, £45, and £74.88 in the first, second and third years of its life respectively. These have a present value of £116.18 when discounted at 10 per cent.

The first step in deriving an expected income figure for, say, the first year of the project's life is to calculate the present value of its outstanding cash flows at the end of that year (V_1). This is given by the following calculation:

$$V_1 = \frac{£45}{(1.10)} + \frac{£74.88}{(1.10)^2} = £102.79$$

Assuming that the first year's cash flow (F_1) is to be received at the year end, the expected total wealth of the shareholders at this time will be:

$$£127.79 = V_1 + F_1 = £102.79 + £25$$

According to the definition of income suggested earlier, income is the amount that can be paid out without reducing total wealth below that at the beginning of the period. Thus, the income for year one is found by deducting opening wealth from that at the end of the year, that is:

$$(£102.79 + £25) - £116.18 = £11.61$$

A more general definition of the income expected from a project in any period (t) can be written using symbols as:

$$\text{Expression I } Y_t = F_t + V_t - V_{(t-1)}$$

where Y_t represents the income for period t , F_t stands for the net cash flow expected in the period and $V_{(t-1)}$ and V_t respectively, stand for the discounted value of a project's cash flows at the beginning and end of the period.

It can be further shown that the amount of expected income for any period is also equivalent to what would be obtained if the expected cost of capital was earned on the value of the project at the beginning of the period. This is because the difference between the shareholders' total wealth at the beginning and end of a period, prior to any dividends being paid out, arises only because the former value is obtained by discounting all cash flows over one extra period. Thus, the present value at the beginning of the period can be made equal to total wealth at the end by accumulating the former over one period at

the going rate of interest, that is:

$$\text{Expression II } F_t + V_t = V_{(t-1)}(1+r)$$

Substituting this new definition of total wealth at the end of the period into Expression I gives:

$$\text{Expression III } Y_t = V_{(t-1)}(1+r) - V_{(t-1)},$$

which after multiplying out and subtracting like terms becomes:

$$\text{Expression IV } Y_t = r(V_{(t-1)})$$

It should be noted that this income measure has been defined without explicitly including a depreciation charge. However, this item can easily be incorporated into the above definition of income. Economic depreciation is normally defined as the loss in asset value over any given period. Thus, the expected depreciation for any period (D_t) is given by deducting from the value of the project at the end of the period from that at the start; that is, $D_t = V_{(t-1)} - V_t$. Using this definition of depreciation, Expression I can be rearranged so as to incorporate depreciation and becomes:

$$\text{Expression V } F_t = Y_t + (V_{(t-1)} - V_t),$$

which can be written as $F_t = Y_t + D_t$. This indicates that the expected cash flow in any year can be divided into two parts: (i) interest on the opening capital value, and (ii) depreciation.

Flower's scheme amounts to using this result to calculate a budget for each year of the project's (or division's) life. The expected income, or interest, for any period is found by calculating the amount that would be obtained if the expected cost of capital was earned on the initial present value of a project or division. Depreciation is computed by deducting from this latter value the equivalent value at the end of the period. Flower gives an example of these calculations for his project A in Table 13 of his article. These figures for project A allow the forecast profit and loss accounts shown in Table 1 below to be calculated.

Flower suggests that figures such as those in Table 1 should be calculated at the time the project is accepted and that they should be compared with the actual cash flows that are achieved in each year of the project's life. Failure to meet these computed

TABLE 1

| | Year 0 £ | Year 1 £ | Year 2 £ | Year 3 £ |
|---|-------------|-------------|-------------|-------------|
| Present value of the project at the end of the year (V_t) | 116.18 | 102.79 | 68.07 | 0.00 |
| Sales less cash expenses (F_t) | | 25.00 | 45.00 | 74.88 |
| Less | | | | |
| Interest ($rV_{(t-1)}$) | | 11.61 | 10.28 | 6.81 |
| Depreciation ($V_{(t-1)} - V_t$) | | 13.39 | 34.72 | 68.07 |

interest and depreciation charges is to be considered *prima facie* evidence of sub-standard performance.

Flower's method: a comment

A major difficulty associated with this method arises because a failure to meet the budgeted figures will only indicate sub-standard performance if all the assumptions underlying the project's acceptance remain unaltered during its lifetime. Assume that the actual net cash flow from project A at the end of the first year is £20 rather than £25. This may not indicate inefficiency if during the period actions have been planned which have caused the cash flow expectations for later years to be revised upwards. For example, the seeming inefficiency in year 1 may be exactly compensated by revised plans which yield an expected increase of £5.50 in the cash flows of the second year. This leaves the present value of the project at the beginning of year 1 unchanged at £116.18.

This change in expectations about cash flows in future years would be detected only if the budgeted depreciation and interest charges for each year were recalculated to incorporate the new information. Similarly, the achievement of Flower's budget for the first period when considered in isolation gives no clear indication of efficiency. For example, assume that, due to inefficiency, the divisional manager achieves the budgeted cash flows in year 1 only by taking action which reduces those expected in the third year by £10. This situation will not be signalled by Flower's method. A correct measure of the divisional manager's efficiency would be given only by recalculating the budgeted profit and loss accounts for the project. This is done in Table 2 below.

As would be expected, the depreciation figure for year 1 is increased because the net present value method gives immediate recognition to any change in circumstances. A comparison of the original budget and the recalculated figures allows the divisional manager's inefficiency to be detected. This sub-standard performance has reduced the project's present value at the end of year 1 from £102.79 to £94.53 – a reduction of £8.26.

A variance thrown up by the comparison between

the original budget for the period and the actual cash flows obtained indicates, at best, that the original assumptions about the period were not realised during the period. It says nothing about future periods. Revised income and depreciation figures are, therefore, necessary before it is possible to say in quantitative terms whether a project is out of control. Thus, the claimed consistency between this measure of short-run performance and investment appraisal models disappears once the assumptions underlying the original calculations are rendered invalid. Further, revised profit and loss accounts render any income concept redundant for they yield not only new interest and depreciation numbers but also new figures for the present value of the project. This latter can be used directly to evaluate the progress of the project.

However, such revised budgets can be obtained only when the revised plans of divisional management are known; that is, after all decisions concerning the future have been taken. But performance measures are normally expected to give some guide to future action; they are useless for this purpose if all decisions have to be taken before such measures can be obtained. A comparison between the original and the revised profit and loss accounts may, however, provide some check on the forecasting ability of those whose estimates formed the basis of the original plans. Moreover, if, at the end of a period, factors beyond management control are forecast to behave differently from what was assumed in the original budget, recalculated profit and loss accounts incorporating the effect of these changes if the original plan of action is maintained may highlight areas requiring management action.

A final difficulty associated with Flower's control model is that it would seem to require a present value to be assigned to each individual division within the firm. This value should, ideally, represent the contribution the division makes to a firm's total value. How this valuation should be made presents a problem if the present value of a sector of a firm is a function of those other assets and resources with which it is combined. A division may have its profits enhanced in some way because it is not independent but rather part of a group.

TABLE 2

| | Year 0 | Year 1 | Year 2 | Year 3 |
|-------------------------------------|--------|--------|--------|--------|
| | £ | £ | £ | £ |
| Present value at year end (V_t) | 116.18 | 94.53 | 58.98 | 0.00 |
| Sales less expenses (F_t) | | 25.00 | 45.00 | 64.88 |
| Interest ($F_t + V_t - V_{t-1}$) | | 3.35 | 9.45 | 5.90 |
| Depreciation ($V_{t-1} - V_t$) | | 21.65 | 35.55 | 58.98 |

Such effects should ideally contribute to the value of the firm on the stock market. However, it is not clear how this valuation can be allocated between divisions.⁴ These problems are well-known in accounting theory but as yet no general accepted solution has been suggested.⁵ These difficulties are especially acute for an existing firm considering implementing Flower's method.

Residual income as the short-run counterpart of the maximisation of the discounted value of the enterprise

Professor Solomons has suggested that the short-run performance of a division is best measured by what he calls the 'residual income' method.⁶ He defines residual income variously for different purposes but all such definitions involve levying against divisional reported profits an interest charge based on the value of the division's capital assets. Excess profits, after meeting costs and this interest charge, represent the division's residual income. Solomons claims that, abstracting from the distortion caused by adherence to certain accounting conventions, the long-run counterpart of maximising annual residual income is the maximisation of the discounted present value of the enterprise.⁷

Flower shows, in Table 8 of his article, that when interest is calculated using the cost of capital rate,

⁴See R. S. Edwards, 'The Nature and Measurement of Income', *The Accountant*, 1938, reprinted in W. T. Baxter and S. Davidson, *Studies in Accounting Theory* (Sweet & Maxwell, 1962).

⁵For some suggested solutions, see S. H. Penman, 'What Net Asset Value?', *The Accounting Review*, April 1970.

⁶D. Solomons, *Divisional Performance: Measurement and Control* (R. D. Irwin, Homewood, Illinois, 1965), Ch. III.

⁷D. Solomons, op. cit., p. 277.

the value of the annual residual incomes for his project A when these latter are discounted back to the time of decision is equal to the project's net present value. This is illustrated in Table 3 below. Discounting the residual income figures shown for each year back to the end of year 0, the time of decision, yields a sum equal to the project's net present value. This occurs because the method of calculating interest and depreciation ensures that when these items for each year are discounted and added to the discounted scrap value, they will equal the present value of the investment necessary for the project. Thus the differences between these annual charges and the annual net cash flows will be equal to the project's net present value when discounted and summed over all years of the project's life.

Thus, in the absence of capital rationing, the acceptance of those projects with total residual incomes that have a non-negative discounted value is equivalent to maximising the discounted present value of the enterprise.

Flower maintains that this proves Solomons' claim. However, Solomons seems to be suggesting that managers by attempting to maximise annual residual income will also optimise the discounted value of the enterprise.⁸ This will be the case only if the interest and depreciation figures used are calculated in the way suggested in the previous section.^{9, 10} This is not the case in Flower's example which uses straight-line depreciation and, therefore, the figures

⁸Flower's view would seem to be based on a mistaken concept of what Solomons actually claims. Flower quotes him as saying that residual income is 'the long-run counterpart' of 'the maximisation of the discounted present value of the enterprise' whereas Solomons actually says that 'the long-run counterpart of this objective' (using residual income 'as a measure of short-run managerial success') 'is the maximisation of the discounted present value of the enterprise'. See Solomons, op. cit., p. 277.

TABLE 3

| | 1 | 2 | Years | Net present value at beginning of year 1 |
|--|---------|-------|--------|---|
| | £ | £ | £ | £ |
| Book value of machine at beginning of year | 105.00 | 75.00 | 45.00 | |
| Sales less cash expenses | 25.00 | 45.00 | 59.88* | |
| Less depreciation (straight-line) | 30.00 | 30.00 | 30.00 | |
| Less 10 per cent interest on book value at start of year | 10.50 | 7.50 | 4.50 | |
| Residual income | (15.50) | 7.50 | 25.38 | 11.18 |
| NPV income (see Table 1) | 11.61 | 10.28 | 6.81 | |

* This figure differs from that shown in Table 2 because following Flower the scrap value of the machine (£15) is netted off in the depreciation calculations; that is, depreciation is based on the purchase price of £105 less the scrap value of £15.

for interest and depreciation bear no clear relationship to those derived in the preceding section. It would seem unlikely that any manager seeking to maximise his residual income for year 1 would wish to accept the project shown in Table 3 with its large negative residual income in that year. He may, therefore, reject a project with a positive net present value.

As Flower himself recognises, the only way to produce annual interest and depreciation charges consistent with the net present value model is to use the calculations suggested in the last section. However, as can be seen from Table 1, this method will give all worthwhile investments a residual income of zero for the net present value method, on which it is based, values the project at its start on the basis of its ability to earn more than the going rate of interest. The depreciation figures suggested are based on this value (£116.18) rather than on the book value of the investment necessary for the project (£105). Thus, when residual income is calculated in this way, managers should aim to break-even on each project in each year of its life. Some would argue that such an instruction would have a weaker motivational effect than a policy that requires either the maximisation of some objective or the achievement of some target. But in any case, as was argued in the preceding section of this article, the consistency between residual income calculated as suggested by Flower and the net present value model is of little practical interest. The equivalence disappears if the assumptions used in calculating residual income figures change during the project's life.

Interest on capital

Considerable controversy surrounds the question of whether the profit figure used for evaluating the short-run performance of divisional management should be net of an interest charge based on the division's existing capital assets; that is, whether the residual income method should be used. Both Solomons and Flower support making such a charge upon divisional management.

They are concerned with situations where divisional managers have substantial freedom to make investment decisions.¹¹ They argue that divisional

managers may not necessarily select those projects which would maximise corporate net worth unless an interest charge is levied on past investments. It is suggested that managers may both select investments that improve their short-term performance at the expense of long-term net worth and ignore the cost of capital in decision-making if the residual income method is not used.

The degree of sub-optimal investment selection if interest charges are not made will depend on the objectives which divisional managers actually seek to obtain. An example of the effect is shown in Table 3 of Flower's article where a manager who seeks to maximise absolute profits in the next year selects a project (B) having a negative net present value and rejects two others (A and C) both of which have positive net present values.

Forcing the divisional manager to use discounted cash flow analysis to make decisions does not overcome the problem. Estimates can be made to justify any project unless it is known that such forecasts will be audited as the project progresses. Evidence presented by Solomons and others suggests that many top managements rely mainly on measures of short-run performance, such as return on net book investment, when monitoring divisional performance in a formal way. Such measures do not really fulfil a post-audit role for project decisions. Solomons, therefore, argues that charging interest on existing capital assets is necessary to force divisional management to consider the cost of funds when making investment decisions.

However, even using the residual income method does not guarantee that all projects having a positive net present value will be accepted. It monitors performance in only the past period and, therefore, does not discourage divisional management from rejecting investment opportunities having high net present values but low net cash flows in the early years of their lives. Such rejections are likely whilst top management continues to rely heavily on short-term measures for evaluating their subordinates. Some suggestions as to how this problem may be partially overcome are given below but no real solution is yet available in the literature.

A major opponent of charging interest on capital is Amey.¹² He firstly argues that in practice divisional investment autonomy of the kind considered by Solomons both is, and should be, very limited. Secondly, he makes the point that charging interest of existing assets may lead to non-profit maximising

⁹This point has also been made by Amey: see L. R. Amey, *The Efficiency of Business Enterprises* (Allen & Unwin, 1969), p. 145.

¹⁰This point is partially made by Solomons, op. cit., pp. 134-41.

¹¹Solomons, op. cit., Ch. III. He seems to interpret widely the power to make investment decisions and includes not only the right to give formal approval to expenditure but also the right to 'persuade' top management to give such approval.

¹²L. R. Amey, op. cit., Ch. VII. See also L. R. Amey, 'Divisional Performance Measurement and Interest on Capital', *Journal of Business Finance*, Spring 1969.

behaviour even where divisional management has considerable power in project selection.¹³

This behaviour arises because charging interest may cause divisional management to restrict output below that where marginal revenue equals marginal cost. Where divisional investment requirements increase with output, the interest charge will also increase with output. Amey suggests that this will mean that the manager who wishes to maximise his residual income will choose that output level where marginal revenue equals marginal cost plus the incremental interest charge for that output level. The latter charge is redundant for marginal cost as normally defined already incorporates all the costs associated with additional output. Amey shows that the intersection of the marginal revenue curve with a cost curve incorporating both normal marginal costs and incremental interest charges will usually occur at a lower level of output than is optimal in terms of profit maximisation.

However, charging interest to projects would be approximately correct in the situation considered by Amey providing that operating decisions are made using the accountant's direct costs. These latter exclude the incremental investment costs required for additional output. Thus, in these circumstances, charging interest would not involve any double counting. However, such interest charges are unlikely to reflect accurately the incremental investment costs of expanding output.

But the real danger is that under a full costing system divisional management may attempt to allocate to product units the interest charged on the division's existing capital assets. Such allocations can only be arbitrary and mistaken pricing and output decisions may result if such charges do enter into unit costs. An extreme example of this is illustrated

in the diagram below.

Imagine a division producing only one product of which the firm can sell as much as it wishes at the going market price (p). Assume also that the variable cost (v) per unit of output is constant up to some capacity constraint and that all production resources are freely available at their going market prices. The diagram illustrates that the optimal output decision (at least in the short-run) is to produce as much as is possible, given the division's limited capacity. In this way the division makes the contribution to fixed overheads and profits shown by the rectangle $p'v'v$. Whereas if a charge for interest per unit of final output equal to, say, vi in the diagram is made it seems as if the division makes a loss of $ii'v'v$, even at the optimal output level.

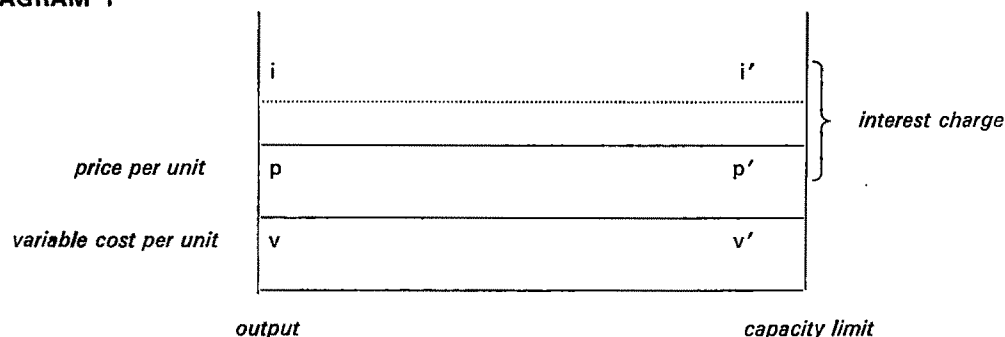
Charging interest, however defined, on existing assets may also cause divisional management to mistakenly alter the scale of part or all of their activities. For example, if a lump sum interest charge equal to $ii'v'v$ were made the above diagram would suggest that the division concerned should be closed down as quickly as possible (assuming that its closure does not affect other divisions adversely). However, interest on historical cost, or on the expected present value of projects at the time of their acceptance, is irrelevant to this decision. Whether the division should be closed will depend on the net income that could be obtained by deploying its resources in the best alternative way. Such a closure decision should be made using the net present value model in the usual way.

Thus, the residual income method may lead to sub-optimal performance in two of the cases described above. Samuels would, therefore, seem to be partially in error when he says, in commenting on the Amey/Solomons debate, that the charging of interest is necessary to ensure an optimal company position in the case which Solomons wishes to consider.¹⁴ A

¹³L. R. Amey, op. cit., pp. 136-147; but for an alternative interpretation of Amey's views see J. R. Samuels, 'Divisional Performance and Interest on Capital: A Contributed Note', *Journal of Business Finance*, Autumn 1969.

¹⁴J. R. Samuels, op. cit.

DIAGRAM 1



dilemma would, therefore, seem to exist. On the one hand, charging interest may lead to sub-optimal decisions concerning existing assets, unless direct costs are used for decision making and the interest rate used correctly reflects the incremental investment costs associated with increasing output. On the other hand, the use of short-run performance measures not involving an interest charge may encourage management to make sub-optimal investment decisions. Some thoughts as to a possible way out of this difficulty are given in the next section.

A possible solution

The dilemma mentioned above arises because the decision rules that management should follow change once an asset is acquired. Prior to acquisition the need is to encourage divisional management to accept all projects with positive net present values. Once an asset is purchased divisional management should be encouraged both to maximise net revenues obtained from it after meeting all incremental costs and to dispose of the asset if it does not cover its opportunity cost.

Thus, the proponents of residual income are asking one technique to do several jobs. Some of these are:

- (1) to help guarantee that assets already acquired are used in a profit maximising way;
- (2) to aid in gauging whether a division or part of a division should be allowed to continue in existence; and
- (3) to encourage the acceptance of only those investment projects which cover the cost of their financing.

The best way to accomplish (1) above would seem to be to set, at the beginning of the year, some sort of 'target' contribution to fixed overheads and profit either for parts of the division or for the division itself. Ideally, this target should reflect the contribution that would be obtained if profit maximising decisions were to be taken. This target should be compared with the results actually achieved for the period. Costs should be defined abstracting from any interest charges to avoid the problems cited in the last section. Several refinements to this performance measure are possible. For example,¹⁵ a comparison

between actual results and an adjusted target allowing for those changes during the period which were beyond the control of management might give a more realistic measure of operating efficiency. A comparison between the original target set at the beginning of the period and that amended for uncontrollable, environmental changes may provide a useful check on the forecasting ability of those whose estimates formed the basis of the original target.

The use of this type of control device should allow the manager to make pricing and output decisions free from the distorting effects of non-incremental interest charges. No monitoring device based on past performance can adequately fulfil the second role listed above. Such questions can be answered only by using investment appraisal models. However, it is possible to suggest an indicator that may help in deciding whether to subject a division to such analysis.

A division, or part of division, should continue in existence if it yields a surplus after meeting its variable costs and the incremental overheads incurred because of its existence sufficient to cover its opportunity cost expressed in terms of foregone net income. This opportunity cost could be levied conceivably as an annual rate of interest on the value of divisional assets in their best alternative use. This value will normally be unrelated to both the historical cost of capital investments and the asset value obtained using Flower's method. Moreover, only with a perfect capital market, where everyone can borrow and lend as much as they wish at the going rate of interest, can the rate of interest used be automatically equated to the company's current cost of capital. Not too much validity for future decisions should be attached to signals obtained using the suggested indicator unless the conditions met in the past are expected to continue unchanged.

The suggested indicator may also help in evaluating whether the division or a part of it should be expanded. A large surplus over opportunity cost might suggest that a growth in divisional activities will be worthwhile. But such signals can suggest only that a full investment appraisal of future divisional activities should be undertaken.

The real role of residual income seems to be to give some signal as to the ability of divisional management to select worthwhile investment projects and, therefore, help in achieving purpose (3) above. Residual income, if correctly defined, can help by monitoring whether correct investment decisions have been made in the past. Managers could not ignore the long-term implications of their investment decisions if such a measure were available.

¹⁵See M. Bromwich, 'Standard Costs for Planning and Control', *The Accountant*, April and May 1969, and J. Demski, 'Variance Analysis using a Constrained Linear Model', in *Studies in Cost Analysis*, ed. D. Solomons, 2nd edition (Sweet & Maxwell, 1968). Many further refinements are possible: see, for example, Y. Ijiri, J. C. Kinard and F. B. Putney, 'An Integrated Evaluation System for Budget Forecasting and Operating Performance', *Journal of Accounting Research*, Spring 1968, and the bibliography cited therein.

The aim is to obtain some type of indicator of how skilled divisional management has been in selecting investments. The measure suggested below is not meant to represent anything more than a preliminary approach to the problem. Much research is needed before a really useful, practical technique can be suggested.

The question being asked is: how well has the manager used funds committed to him in the past? Ideally, this could be answered by setting up studies at the time of decision to monitor both the investment actually undertaken and the alternatives thereby foregone. A superior ability to select projects would be indicated if the total returns from the accepted opportunities were consistently above those which would have been obtained on rejected alternatives. Given uncertainty, the return from both types of projects is unlikely to be that which was expected at the time of decision but if the manager is to be regarded as skilled in project selection selected projects should on average yield a greater return. It is unlikely that any firm will go to such lengths to check on past investment decisions but some system of monitoring is required especially in the context considered by Solomons.

Thus, a crude measure may be of some use. Assume a situation where funds if they had not been committed to one divisional manager would have been given to some other division. In this situation it can be argued that the opportunity cost of a manager's past investment decisions is the return from the best investment that another manager could have undertaken if he had been given the funds. An inter-divisional comparison of the historical, cash flow return obtained over a reasonable time period on the capital committed to each division in the past may approximate to this measure and give some idea of relative skill in selecting investment opportunities. Indeed, merely comparing each division's return computed in this way with the average for the entire corporation may partially serve this purpose.

Cash flows are used rather than accounting profits so as to avoid the possible distortions associated with normal accounting definitions of profit.

The suggested measure needs adjustment in conditions of inflation. However, the difficulties associated with this adjustment are no different from those normally discussed in the literature. Such adjustments will, therefore, be ignored in this article so as to ease the exposition.

Capital rationing within the firm is implied by the view that if the funds were not used by one division they would be used by another. The measure suggested could be amended to be appropriate for a perfect capital market.

Clearly, there are many difficulties attached to the suggested measure. Some of these are outlined below but first it is necessary to examine the above suggestion in more detail. It will also be shown how the residual income concept might be used to provide the monitoring device suggested.

One variant of the measure being considered could be obtained by calculating whether the historical cash flows of a division after meeting all incremental costs are sufficient to provide the company's average historical return on the value of the funds committed to the division in the past. The historical cost of the assets is the correct valuation basis to use because the aim is to assess whether the divisional manager has used his investment funds as well as other corporate managers with project selection responsibilities. As an example, assume that these latter are achieving an average return of, say, 10 per cent on the funds committed to them in the past but that the management under consideration is obtaining only 5 per cent. This yields *prima facie* evidence that the latter's investment skills need to be investigated.

Such reasoning suggests that there is a use for residual income method providing that interest is levied on the historical cost of the division's assets and that the interest rate reflects the average historical return obtained throughout the company as a whole. As will be explained, this measure must be used with considerable care and the temptation to use it to assess the future profitability of a division must be resisted.

Further, it should be borne in mind that the rate of interest used with this performance measure should ideally reflect what the company could have earned if the funds had not been committed to the manager under consideration but rather had been allocated to some other manager. The average company-wide return is an extremely crude measure of this and does not represent an optimal standard. This problem might be partially overcome by constituting *ad hoc* studies to estimate the return that would have been obtained on funds if these had been committed to the manager in the company with the, say, 'best' record in the past. Alternatively, the performance of superior managers in other companies operating in the same sphere as the manager under consideration might be used if the data are available.

This latter criterion should result in a better test, for using the company's average historical rate of return implies that all the firm's divisional managers face investment opportunities offering on average this return. That is, it is assumed that the manager of a division with products of declining marketability can if he wishes diversify into other areas of activity.

This assumption goes against the whole concept of divisionalisation.

Thus, if the average corporate return were used as the interest rate, subjective adjustments would have to be made to divisional results where policy constraints restricted divisional activities to certain spheres of operations – the target rate being lowest for those managers restricted to low-profitability areas and raised for those operating in sectors offering more opportunity for high profits.

However, the use of the performance of similar managers in other firms as a standard also involves some implicit assumptions about the freedom of action of the manager under consideration. For example, the comparison would lose some validity if the latter were confined in his operations to certain geographical locations which differed from those available to similar managers in other firms.

It should be understood that no test rate of the above type will necessarily be achieved in any given period. In some years a manager may have many investments which have not yet started to yield returns. Ideally, it would be necessary to estimate the future value of such returns and include them in the suggested annual comparison. However, the need for such estimates can be partially overcome if the measure considered in this section is calculated as an average over a reasonable number of time periods. All investment activities should in time generate benefits which will be reflected in this measure.

Further, it is to be expected that a division specialising in investments of a highly risky nature will obtain considerable surpluses in some years and large losses in others. The ability to make good investments in such a situation cannot be assessed by looking at the results of any one period in isolation. The variability of a division's yearly return around the average will depend in part on the intrinsic riskiness of the investments undertaken by the division. Thus, the forecast degree of uncertainty attached to the division's investments must be adjusted for in some way before any test using the annual returns in isolation can be used. The literature provides few clues as to how this may be done, though it might be possible to adapt some of the measures suggested for evaluating the performance of security portfolios.¹⁶

Considerable problems need to be solved before the suggested measure can be used easily in situations where divisions are not independent of each other. For example, a firm might be willing to allow a division which yields a relatively low return to

continue in existence because its product market is affected by different factors from those influencing the firm's other activities. Above average results from such a division may be expected to offset below average returns in other areas of the company, and thereby help maintain the stability of corporate earnings. The suggested criterion will need to be adjusted for factors of this sort. Similarly, the different state of technical progress between divisions must also be taken into account.¹⁷

A final problem that needs to be faced is the problem of valuing existing capital assets. This is necessary either when a firm is thinking of adopting the system or when a new manager takes over a division within a firm already using the system. Ideally, this problem can be met by evaluating the division's future prospects using the net present value model. However, the discount rate used in this exercise implies a forecast of the future performance of the division. If this estimate is incorrect, as it is likely to be, the assets committed to the divisional manager will be incorrectly valued.

In practice, it is likely that the valuations required will be arrived at by a process of negotiation between top management and divisional executives. These valuations are likely to be re-negotiated in the light of the divisional results achieved over time.

Conclusions

These difficulties notwithstanding, it is believed that using refined versions of the above performance measure in conjunction with those suggested for purposes (1) and (2) above may represent the beginnings of a solution to some of the difficulties associated with the residual income method. It is suggested, further, that performance measures of this type may go some way towards reconciling the two sides of the debate concerning the inclusion of interest charges in performance measures used for assessing divisional efficiency. It is hoped that the methods proposed in this article may encourage the search for better measures of managerial performance.

Improved performance measures for this area are vitally necessary. On the one hand, it does not seem possible to use schemes such as those suggested by Flower, and on the other the residual income concept seems to have severe defects unless used with both great care and an awareness of the effects its use may have on resource allocation decisions. It is, therefore, not surprising that many firms¹⁸ continue to use

¹⁷Some solutions to these problems will be suggested in a forthcoming paper.

¹⁸J. Mauriel and R. Anthony, 'Misevaluation of Investment Centre Performance', *The Harvard Business Review*, March–April 1966 – reports American Practice.

¹⁶See J. P. Williamson, *Investments: New Analytical Techniques* (Longman, 1970), Ch. 2 and 3.

some variant of return on investment for monitoring the performance of divisional management even in the face of the well-known theoretical defects

associated with this technique.¹⁹

¹⁹For a good review of these see D. Solomons, *op. cit.*, especially Ch. II and V.

Normal Assumptions in Decision Making

E. Lusk

Introduction

Many methods of statistical analysis are used to draw inferences about a population from sample data. The sampling rationale is usually formalized considering Type I and Type II errors relative to the test hypothesis (H_0) and its alternative (H_1). Type I errors result when the test hypothesis H_0 is true but rejected, leading to an erroneous alternative course of action. Type II errors result in the alternative hypothesis H_1 being accepted when H_0 represents the true state. The number of data elements to be sampled is related to the nature of the test hypothesis and the desired level of confidence. The manager should realize that there is always a degree of uncertainty, specifically the level of confidence relative to making a Type I error. Consequently, some percentage of the time the wrong course of managerial action may be indicated by the sampling program. If the probability density assumptions underlying the statistical test are erroneous, a degree of *unanticipated* uncertainty may be interjected into the decision process. As Green and Tull¹ note; heretofore little attention has been paid to the effect of erroneous density assumptions on the decision-making process. Since inferences drawn from sample data may affect the manner of resource allocation, it becomes a problem of more than academic interest to examine the relationship between the density assumptions underlying hypothesis testing and the resultant decision information.

It is sometimes erroneously assumed² in hypothesis testing that the sample population is normally distributed and the parameters estimated reflect the population parameters. However, in many situations there is no reason to believe the sample is normally distributed; and in some cases evidence may exist to the contrary. Under such circumstances, the decision-maker often assumes normality and tests the hypothesis as if density assumption errors could be ignored.

This paper is addressed to (1) an examination of the estimation effects of erroneously electing the normal assumptions, and (2) a consideration of density and distribution-free alternatives to the classical parametric methods. In order to facilitate this analysis, a brief examination of the development of the normal density will be presented.

The normal curve

The normal curve was independently formalized in the 1800s by two famous mathematicians, LaPlace and Gauss, as a byproduct of their interest in the mathematics of astronomical observations. Recognizing that the errors in astronomical observations seemed to follow a recurrent pattern, LaPlace and Gauss formalized this empirical error distribution into a mathematical density function. They specified two conditions necessary to characterize this distribution mathematically.

(1) the observation errors should be distributed

¹ Green, P. E. and Tull, D. S., *Research for Marketing Decisions*, (Prentice-Hall, 1970) second edition, p. 308.

² Careless thinking and cookbook approaches to classical statistical tests may lead one to cite the central limit theorem (CLT) as the justification for assuming the sample population is normally distributed; however, the central limit theorem refers to the distribution of sample means. To demonstrate this point we randomly selected 1,000 samples of 100 elements each on 2 variables from a population ($N=900$) of bank loans. The *population* variables exhibited skewness coefficients of 1.18, 1.70 and a kurtosis coefficient of 4.16, 5.96 respectively. We computed the skewness and kurtosis of each of the 1,000 samples and compared them to a skewness interval $0 \pm .5$ and kurtosis interval $3 \pm .5$. The results were:

| | Variable 1 | Variable 2 |
|---------------------------------|------------|------------|
| Samples Within Both Intervals* | 8 | 3 |
| Samples Outside Either Interval | 992 | 997 |
| | 1,000 | 1,000 |

*A necessary condition for normality. Therefore, sampling elements from a population for *specific* samples has no relationship to the CLT, and is therefore never a justification for assuming the normality of the sample.

such that the mean observation symmetrically divides the population, and

- (2) the frequency of observations approaches zero as one deviates from the mean value so that at the extremes of the distribution the probability of an occurrence of an observation is approximately zero.

Representing these conditions in a differential equation and solving as a probability distribution (Appendix A) they obtained the well-known standard normal distribution (mean zero and variance one).

$$f(x) = (1/\sqrt{2\pi})e^{-\frac{x^2}{2}}$$

This simple but mathematically elegant density function has since been applied (with what approaches abandon) to problems of inferential statistical analysis. The density assumptions implied by the normal distribution may be difficult to justify when considering the normal density as a hypothesis testing construct. According to L. C. Geary

Our historian will find a significant change of attitude about a quarter century ago following the brilliant work of R. A. Fisher who showed that, when universal normality would be assumed, inferences of the widest practical usefulness could be drawn from samples of any size. Prejudice in favor of normality returned in full force and interest in non-normality receded to the background (though one of the finest contributions to non-normal theory was made during the period by R. A. Fisher himself), and the importance of the underlying assumptions were almost forgotten. References (when there were any at all) in the textbooks to the basic assumptions were perfunctory in the extreme. Amends might be made in the interest of the new generation of students by printing in leaded type in future editions of existing textbooks and in all new text-books: *Normality is a myth; there never was, and never will be, a normal distribution* . . .³

This may be an overstatement of the case, but represents a healthier research posture than one which blindly assumes normality.⁴

In the next section of the paper two⁵ properties implied by using the normal density for hypothesis testing, are examined:

I. Symmetry about the distribution mean (absence of skewness), and

II. A constant distribution peakedness (kurtosis)

The violation of the assumption that these properties hold will be examined as it may affect inferences drawn from hypothesis test results.

³ Geary, R. C., 'Testing for Normality', *Biometrika*, 1947, vol. 34, p. 210.

Property I – Symmetry about the mean

Usually, economic data is bounded either from above and/or below resulting in a skewed distribution. The skewness of a distribution has a numeric representation (a normalized third moment) which if negative (positive) indicates the distribution is skewed left (right). Right (left) skewness indicates that more than half of the probability mass exists to the right (left) of the arithmetic mean. (Figure 1.) The implication, which shall be quantified in the next section, is that if a distribution is skewed and the normal assumptions are made, there will be a difference between the actual probability mass in the critical areas and the assumed probability mass, given the assumption of normality. For the skewed density A (Figure 1), the probability of finding an observation greater than X_1 is 10 per cent: $P_A(X \geq X_1) = .10$; while for the normal density, with the same mean and variance, this probability is 5 per cent: $P_N(X \geq X_1) = .05$.

Property II – Distribution Peakedness

Like skewness there is a quantitative measure of the distribution's peakedness. In the case of a normal distribution the kurtosis coefficient (a normalized fourth moment) is equal to 3. If the actual distribution is peaked (leptokurtic) relative to the normal distribution, the kurtosis coefficient will be greater than 3; if the actual distribution is flat (platykurtic) relative to the normal distribution the kurtosis coefficient will be less than three.

The degree of kurtosis affects not only the central portion of the distribution but also the probability mass existing in the tails of the distribution (critical areas). In contrasting (Figure 2) non-normal kurtosis with the probability mass existing in the tails of the normal distribution one finds:

- (1) for leptokurtic densities the probability mass in the extremes of the distribution is greater relative to the normal, and
- (2) for platykurtic densities the probability mass in the extremes of the distribution is less relative to the normal.

⁴ Bradley, James V., *Distribution-Free Statistical Tests*, Prentice-Hall Inc., 1968, pp. 28–29.

⁵ Continuous variables and infinite variable range are two other major properties which are implied by the use of the normal density. These assumptions may also affect the decisions effected by the hypothesis testing. However, the skewness and kurtosis coefficients have quantitative coefficient representations whereas the violation of the continuous variable and infinite range may be difficult to represent in a general quantitative manner. Also to an extent the quantitative representations of skewness and kurtosis may indirectly represent the infinite range and continuity assumption. For example, skewness is often associated with a random variable that is bounded either from above or below.

FIGURE 1

Skewed Distribution (Density A) and Normal Distribution (Density N) with Equal Means and Standard Deviation

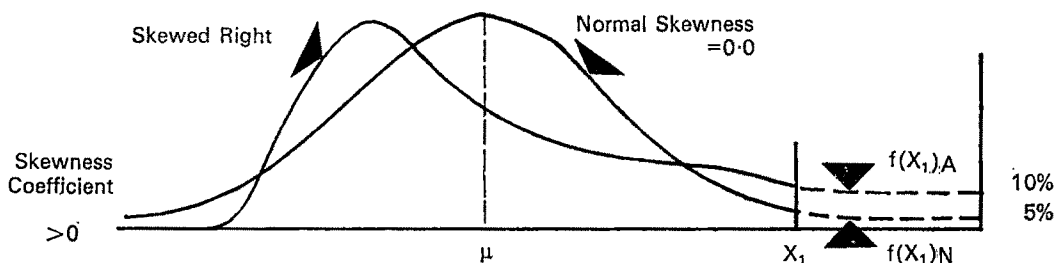
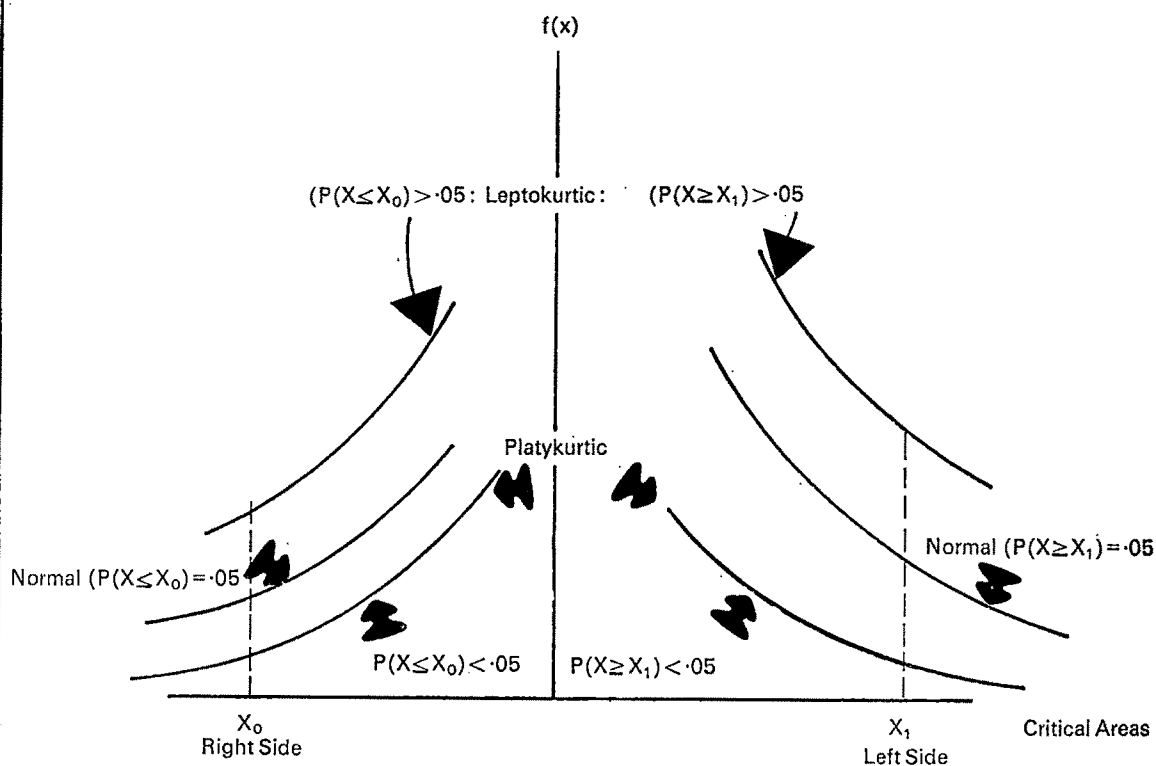


FIGURE 2

The effect of Kurtosis on the extremes of the density



As in the case of skewness, it is important to recognize that when a distribution exhibits an abnormal degree of kurtosis the probability estimates will vary from those derived assuming normality.

Effect of skewness and kurtosis

In order to illustrate the effect of skewness and kurtosis on probability estimates derived from test of random variable location, we have selected a four

parameter density family formalized by Karl Pearson (1857-1936). In Table 1 point probabilities are presented for Pearson standardized variates. *Note*: the value of the standardized Pearson variate for skewness zero and kurtosis three is 1.64 which is also the 5 per cent 'Z' value for a normal standardized variate. As the skewness and kurtosis depart from zero and three respectively, one notices the alteration in the value of the standardized Pearson variate at the 5 per cent level.

TABLE 1⁶

Upper 5 per cent points of the Pearson Standardized Deviate $(x - \mu)/\sigma$

| | | Skewness β_1 | | | |
|-----------|---|--------------------|------|------|------|
| | | 0 | 1 | 2 | 3 |
| Kurtosis | 2 | 1.61 | 1.72 | 1.72 | 1.72 |
| β_2 | 3 | 1.64 | 1.74 | 1.78 | 1.82 |
| | 4 | 1.62 | 1.69 | 1.72 | 1.75 |
| | 5 | 1.60 | 1.66 | 1.68 | 1.71 |

⁶ Kendall, M. G., *Rank Correlation Methods*, Third Edition, (London, Griffin and Co. Ltd.) 1962.

Scheffé has also computed a sensitivity table which may generate insights into the effect of kurtosis on inferences to be drawn from variance testing. A portion of his computations is represented in Table 2.⁷

TABLE 2

Effect of Non-normality on the True Probability of a Normal 95 per cent Confidence for σ^2 not covering the True σ^2

| Kurtosis Probability | 2 | 3 | 4 |
|----------------------|------|-----|-----|
| | .006 | .05 | .11 |

The conclusion is that non-normal kurtosis has an effect, although skewness seems to have a more dramatic effect, on tests of the mean; and a significant effect on variance tests.⁸ For example, utilizing 900 bank loan observations the following tests were

⁷ Scheffé, Henry, *The Analysis of Variance* (John Wiley and Sons, 1959), p. 337.

⁸ Also see Box, G. E. P., 'Non-Normality and Tests on Variances' *Biometrika*, vol. 40, 1953, pp. 318-335.

TABLE 3

Bank loan population (N=900)

| Statistics | | Actual population statistics | | |
|-----------------|------------|------------------------------|------------|------------|
| | | Variable 1 | Variable 2 | Variable 3 |
| Variance | σ^2 | 136.88695 | 2.63321 | 65.46400 |
| Arithmetic Mean | μ | 26.48332 | 1.41111 | 7.15778 |
| Std. Deviation | σ | 11.6944 | 1.62272 | 8.09098 |
| Std. Skewness | β_1 | -0.42006 | 1.18123 | 1.70326 |
| Std. Kurtosis | β_2 | 2.20765 | 4.16559 | 5.96298 |

TABLE 4

Critical x for the z Value Contrasted with Actual Occurrences (Using the z statistic values of x for z values of

.05, .01, .001 are found using the formula $z = \frac{x - \mu}{\sigma}$ or $x = \sigma z + \mu$)

| Confidence Level | | Critical X for Test Variables | | |
|----------------------|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| z-Statistic | | Variable 1 | Variable 2 | Variable 3 |
| z at .05 | | 45.720608 | 4.0804854 | 20.46744210 |
| z at .01 | | 53.672800 | 5.1839350 | 25.96930850 |
| z at .001 | | 62.1901600 | 6.4253158 | 32.15890820 |
| | | $\beta_1 = -0.42$ $\beta_2 = 2.21$ | $\beta_1 = 1.18$ $\beta_2 = 4.17$ | $\beta_1 = 1.70$ $\beta_2 = 5.96$ |
| | | Variable 1 | Variable 2 | Variable 3 |
| Actual No. @ .05 | Expected No. @ .05 | 0 | 45 | 65 |
| | | > 45: 45 | > 4: 45 | > 20: 45 |
| Actual No. @ .01 | Expected No. @ .01 | 0 | 21 | 37 |
| | | > 53: 9 | > 5: 9 | > 25: 9 |
| Actual No. @ .001 | Expected No. @ .001 | 0 | 7 | 15 |
| | | > 62: \approx 1 | > 6: \approx 1 | > 32: \approx 1 |

constructed:

Test 1 – Given the 900 population observations on three variables, we computed the mean, variance, skewness and kurtosis coefficients (Table 3). With this information, right side random variable values were computed for the 'Z' statistic at .05, .01 and .001 levels of confidence ($X = Z_i\sigma + \mu$; $i = .05, .01, .001$). A table was then constructed to indicate the number of random variable occurrences expected to exceed the critical 'X' as contrasted with the actual occurrences of random variable in excess of the critical X. Results are reported in Table 4.

Test 2 – Thirty samples consisting of 30 elements on the three variables were selected and comparisons of random variables (estimates and actuals) were made based upon the critical value

$$x = t_s / \sqrt{n} + \bar{X} (i = .05, .01, .001)$$

Results are reported in Table 5.

Test 3 – Confidence intervals on the variables' variance were computed at two different levels of confidence given the following relationship⁹:

$$\frac{(X - \bar{X})^2}{\chi^2_i} \leq \sigma^2 \leq \frac{(X - \bar{X})^2}{\chi^2_{1-i}} \quad i = .05, .01$$

The actual variance for the population variables were then compared with the appropriate interval. Results are reported in Table 6.

These tables indicate the effect on locational tests (Tables 4 and 5) as well as variance tests (Table 6). We see that if the density is skewed left and platykurtic (variable 1) there is significantly less probability in the right side critical area than expected given the normal assumption. For example, at the 5 per cent level of confidence, we expect 45 ($900 \cdot .05$) variable realizations to exceed the critical $X = 45.72$. In this case there were no variable values in excess of 45.72. For the other variables, both of which exhibited right skewness and leptokurtosis, we expected too few (with one exception: see variable 2 where actuals equalled the expectation) occurrences relative to the actual realizations. The actual/expected differential was manifested in both cases: where we assumed the mean and variance were known (Table 4) and where we assumed the mean and variance were to be estimated (Table 5). The skewness and kurtosis also had an effect on the variance test interval as can be seen by examining Table 6.

Violation of the normal assumptions: its decision effects

In the previous section, the effects of skewness and kurtosis on probability estimates were briefly

TABLE 5

Number of times out of thirty the population contained realizations which exceeded the expectations

| Confidence Level: t | Variable 1 | Variable 2 | Variable 3 |
|---------------------|------------------|------------------|------------------|
| Tests | $\beta_1 = .42$ | $\beta_1 = 1.18$ | $\beta_1 = 1.70$ |
| | $\beta_2 = 2.21$ | $\beta_2 = 4.17$ | $\beta_2 = 5.96$ |
| > 95% | 5 | 28 | 26 |
| > 99% | 0 | 28 | 30 |
| > 99.9% | 0 | 30 | 30 |

TABLE 6

Interval tests on the three variables: Number of times the sample interval contained the true variance

| | Variable 1 | Variable 2 | Variable 3 |
|----------------------|------------------|------------------|------------------|
| χ^2 Sample | $\beta_1 = .42$ | $\beta_1 = 1.18$ | $\beta_1 = 1.70$ |
| Interval | $\beta_2 = 2.21$ | $\beta_2 = 4.17$ | $\beta_2 = 5.96$ |
| 95 per cent interval | 987 | 889 | 785 |
| 99 per cent interval | 996 | 967 | 892 |

examined. In this section, we will incorporate into the analysis the decision processes which depend upon hypothesis tests. The issue to be addressed is that the violation of the normal assumptions must be evaluated in terms of the decision costs effected by unanticipated alterations in the confidence placed in the results of hypothesis tests. To provide a framework of analysis, a production control illustration has been selected.

Production control decisions often depend upon inferences drawn from samples of the production flow. The economic rationale suggested for the sampling program is usually formalized in terms of the costs related to sampling and corrective actions motivated from hypotheses test results. The magnitude of these costs may vary with circumstances; however, some of the recognizable sampling program costs are:

(1) Collection costs:

- personnel, processing, and/or equipment costs to gather the sample measurements,
- production time delays caused by the sampling program, and
- direct cost of the item if the sample is a destructive sample.

(2) Processing of the sampling data:

- computer time required by the statisticians to process the gathered data,
- statistician salaries required to effect the procedures of the sample program, and
- communication costs.

The only assumption we shall make about the sampling costs is that they are directly related to the number of items sampled, and therefore increase as the

⁹ Mood, A. M. and Graybill, F. A., *Introduction to the Theory of Statistics* (McGraw-Hill, New York, 1963), p.254.

number of items sampled increases.

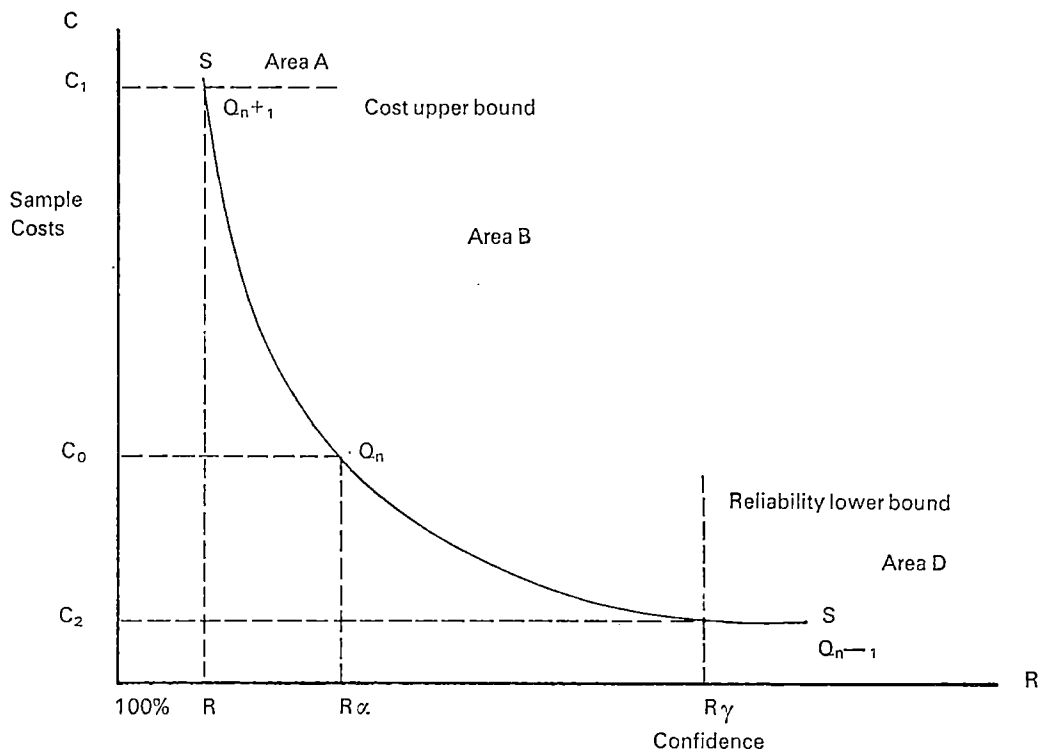
The benefits derived from the sampling program relate to the degree of control (in this case, the confidence level established for a Type I error on production process variability) over the production process as it reduces rework costs for goods returned and consumer dissatisfaction. The sample program, then, may be rationalized on the trade-off between sampling costs incurred and the desired level of confidence. See Figure 3. In area 'A' one recognizes that regardless of how much is expended on the sampling program, there will always be (even though minimal) reworking and replacement costs. Area 'B' represents the sample space into which the sample is expected to fall. When Q_n items are sampled at a total cost of C_0 , the desired level of confidence is R_α . In Area 'D' it is recognized that sampling Q_{n-1} items will reduce costs to C_2 while reducing confidence to R_γ (a level below which management refuses to fall). Therefore, management desires to maintain a level of confidence of R_α with a buffer of $R_\alpha - R_\gamma$.

We shall now examine the cost effect of the normal¹ assumption upon the SS curve represented in Figure 3. If the population is not normally distributed (skewness and kurtosis different from zero and three respectively), there may be a cost in making the assumption of normality relative to the expected degree of control effected by the sampling program.

For example, assume that a decision-maker wants to screen production lots so that 95 per cent ($R_{95, \alpha} = 95$; Figure 3) of the time production lots with more than 1 per cent defective items (breakage variability exceeding tolerances) are not shipped. Given this specification, an appropriate sample size Q_n is established at cost C_0 . However, if the sample exhibits non-normal skewness and kurtosis, the sample/control premises may be altered as follows: If the sample density is leptokurtic and skewed to the right (refer to this as Condition A) there is more probability mass in the right side critical area than anticipated. If the sample density is platykurtic and skewed left (refer to this as Condition B) there is less

FIGURE 3

Sample cost/Confidence trade-offs



The SS curve (Figure 3) may be thought of as a trade-off curve assuming normality. Recognise that increasing the sample size say to Q_{n+1} while ignoring the skewness and kurtosis information, will only increase confidence in the normal parametric estimates (mean and variance). The unanticipated error in excess of the selected by management will still exist when non-normal skewness and kurtosis is present. See table 4.

probability mass in the right side critical area than anticipated.¹⁰ See Figures 1 and 2.

Given Condition A, the cost of sampling provides less than a 5 per cent probability of rejecting a production lot having 1 per cent defective elements (which may be less than the reliability lower bound R_L). The production lots sold may therefore have more than a 1 per cent defective rate at the acceptable risk level of 5 per cent. Consequently, the replacement and reworking rate may be greater than management anticipated. Given these circumstances, we may find increased 'after costs' resulting from:

- (1) excessive product replacement, and
- (2) order cancellations owing to:
 - (a) increased customer rejection rate, and
 - (b) permanent market share shrinkage caused by customer dissatisfaction.

Given Condition B, the cost of sampling provides a greater than a 5 per cent probability of rejecting a production lot with a defective rate of 1 per cent. Consequently, the production sampling is excessive relative to the managerial risk level of 5 per cent. The economic pay-off from recognition of the sampling over-kill result from reducing:

- (1) the number of items selected (an important consideration where destructive sampling is employed),
- (2) the manpower needed to effect the sampling procedures, and
- (3) processing delays required to gather and analyze the sample data.

For example, assume that the XYZ Company manufactures cables for industrial use, and that a new heating method is being used to harden the cables. The sampling hypothesis procedure is to randomly select cables and perform strength tests on them to isolate production lots whose tensile strength variability is beyond acceptable limits. This is important since the contract with the companies supplied by XYZ Company specifies that XYZ will replace all cable lots with excess breakage variability. The XYZ Company is sensitive to this contractual return arrangement for two reasons:

- (1) since immediate replacement is necessary, ordinary production must be postponed while the cable ordered to specification is manufactured, and
- (2) the cable industry is a highly competitive one and supplier switching is likely to occur for price as well as quality dissatisfaction.

¹⁰ There are two effects contributing to these conditions: the skewness and kurtosis effect (refer to Figures 1 and 2). The converse (left side critical areas under conditions A and B) of this general statement does not follow since the density's kurtosis contribution to conditions A and B are offset by the density's skewness.

Assume the production control manager samples Q_n cables subject to the new process and requires a 5 per cent degree of confidence that the variability of breakage strengths has not increased. Further, assume that the sample of n items generates the following skewness and kurtosis coefficients:

$$\beta_1 = 1.0$$

$$\beta_2 = 4.0$$

From Table 7 we may observe the following deviation from the 95 per cent confidence level caused by the skewness and kurtosis coefficients.

TABLE 7¹¹

Skewness and kurtosis effect on hypothesis rejection: Normal contrast with a Pearson Type I Distribution

| | | Skewness | | |
|----------|---|----------|-------|-------|
| | | 0 | 1 | 1.5 |
| Kurtosis | 2 | 1.46 | 1.33 | 1.20 |
| | 3 | 5.00 | 4.87 | 4.74 |
| | 4 | 12.08 | 11.95 | 11.82 |

Therefore, if the manager erroneously assumes normality an unanticipated alteration in the confidence level will have occurred. In this case, the chance of additional return is 6.95% (11.95%—5.00%) greater than anticipated given the normal assumptions. Therefore, given the quantity of shipped cables 'S' there may be $S * (11.95\% - 5.00\%)$ unanticipated additional returns. The additional costs regarding the altered uncertainty owing to the erroneous normal assumptions may be estimated as:

$$S * (11.95\% - 5.00\%) * \theta + \Lambda(\cdot)$$

where:

θ represents the estimated average costs involved in replacing faulty cables,

$\Lambda(\cdot)$ is a function which translates the increase in the rate of defective cables into expected costs of market deterioration.

Statistical testing: The alternatives

The emphasis of this analysis has been to illustrate the development of the normal curve and discuss the problems created by ignoring skewness and kurtosis. To complement this analysis, we shall now consider two alternatives to electing the normal assumptions:

- (1) Pearson Distributions, and
- (2) Distribution Free Methods.

A four parameter family of density functions: A density alternative

The normal density function is characterized by two parameters: the mean and variance. For the normal distribution, the skewness and kurtosis parameters

¹¹ This illustration was adapted from Davies, Owen L., *The Design and Analysis of Industrial Experiments* (Oliver and Boyd, London, 1956), Appendix 2-A.

are extraneous information relative to characterizing a specific normal density. To provide a density alternative, we have selected a family of densities which utilize skewness and kurtosis information in their characterization. This family was developed by Karl Pearson¹² and bears his name. The Pearson family is categorized into seven basic density types depending upon the magnitude of the skewness β_1 and kurtosis β_2 coefficient. The Pearson family is represented by the following densities:¹³

| Type | Equation | Limits for x |
|------|---|------------------------|
| I | $y = y_0 \left(1 + \frac{x}{a_1}\right)^{m_1} \left(1 - \frac{x}{a_2}\right)$ | $-a_1 \leq x \leq a_2$ |
| II | $y = y_0 \left(1 - \frac{x^2}{a^2}\right)^m$ | $-a \leq x \leq a$ |
| III | $y = y_0 e^{-y} \left(1 + \frac{x}{a}\right)^{\gamma a}$ | $-a \leq x < \infty$ |
| IV | $y = y_0 e^{-v \tan^{-1} x/a} \left(1 + \frac{x^2}{a^2}\right)^{-m}$ | $-\infty < x < \infty$ |
| V | $y = y_0 e^{-\gamma x - p }$ | $-\infty < x < \infty$ |
| VI | $y = y_0 (x - a)^{q_2} x^{-q_1}$ | $a \leq x < \infty$ |
| VII | $y = y_0 \left(1 + \frac{x^2}{a^2}\right)^{-m}$ | $-\infty < x < \infty$ |

The Pearson family provides a more comprehensive population description when skewness and kurtosis are non-normal. According to Pearson and Hartley:

'A considerable proportion of current statistical research is concerned with the determination of the sampling distribution of statistics required either as estimators or for use in tests of signi-

ficance. It is often the case that while the distribution itself cannot be expressed in any simple form, the sampling moments can be derived and numerical values calculated either precisely or as approximations. In a great number of cases such investigation shows that the distribution tends to the normal form as the sample size is increased. However, this information regarding the limit is often not sufficient, and we require an answer to the question: what error is involved in assuming normality when the sample size has specified value, n ? In other words, to what extent in practice will the knowledge of the expectation and standard error of a particular statistic suffice?

In many instances experience has shown the value of the Pearson curves in approximating, on the basis of known moments, to the distributions of frequency functions which are either undetermined or are not readily expressed in simple form. In addition, these curves, of course, represent exactly the distribution of a number of the statistics in common use, e.g., X^2 , t and F .¹⁴

Therefore, rather than assuming normality, and discarding the skewness and kurtosis information one may (1) compute the appropriate measure of central tendency, variance, skewness β_1 and kurtosis β_2 (2) based upon the parameters β_1 , β_2 select the appropriate Pearson distribution - (Chart 1), and (3) test hypotheses by computing test statistics which may be compared to tabled Pearson distribution values (see Table 1). For example, Bailey¹⁵ selected a sample ($n=80$) which had the following skewness and kurtosis characterization

$$\beta_1 = .594$$

$$\beta_2 = 4.414$$

Referring to Chart 1 these magnitudes of skewness and kurtosis indicate the relevant density was a Type IV Pearson distribution. Table 8 compares the upper and lower .5, and 5 per cent test levels for the Pearson IV and the normal curve.

Bailey concluded that failure to recognize the skewness and kurtosis coefficients would signi-

¹² See: Pearson, Karl, *Philosophical Transactions of the Royal Society of London*, Series-A, 1895, pp. 343-414; Pearson, Karl, *Philosophical Transactions of the Royal Society of London*, Series-A, 1901, pp. 443-459; Pearson, Karl, *Philosophical Transactions of the Royal Society of London*, Series-A, 1916, 429-457.

¹³ Kendall, M. G. and Stuart, A., *The Advanced Theory of Statistics*, vol. 1 (Hafner: New York, 1958), pp. 148-158.

¹⁴ Pearson, E. S. and Hartley, H. O., *Biometrika Tables for Statisticians*, vol. 1 (Cambridge University Press, 1966), p. 88.

¹⁵ Bailey, N., *Biometrika*, 1950, pp. 193-202.

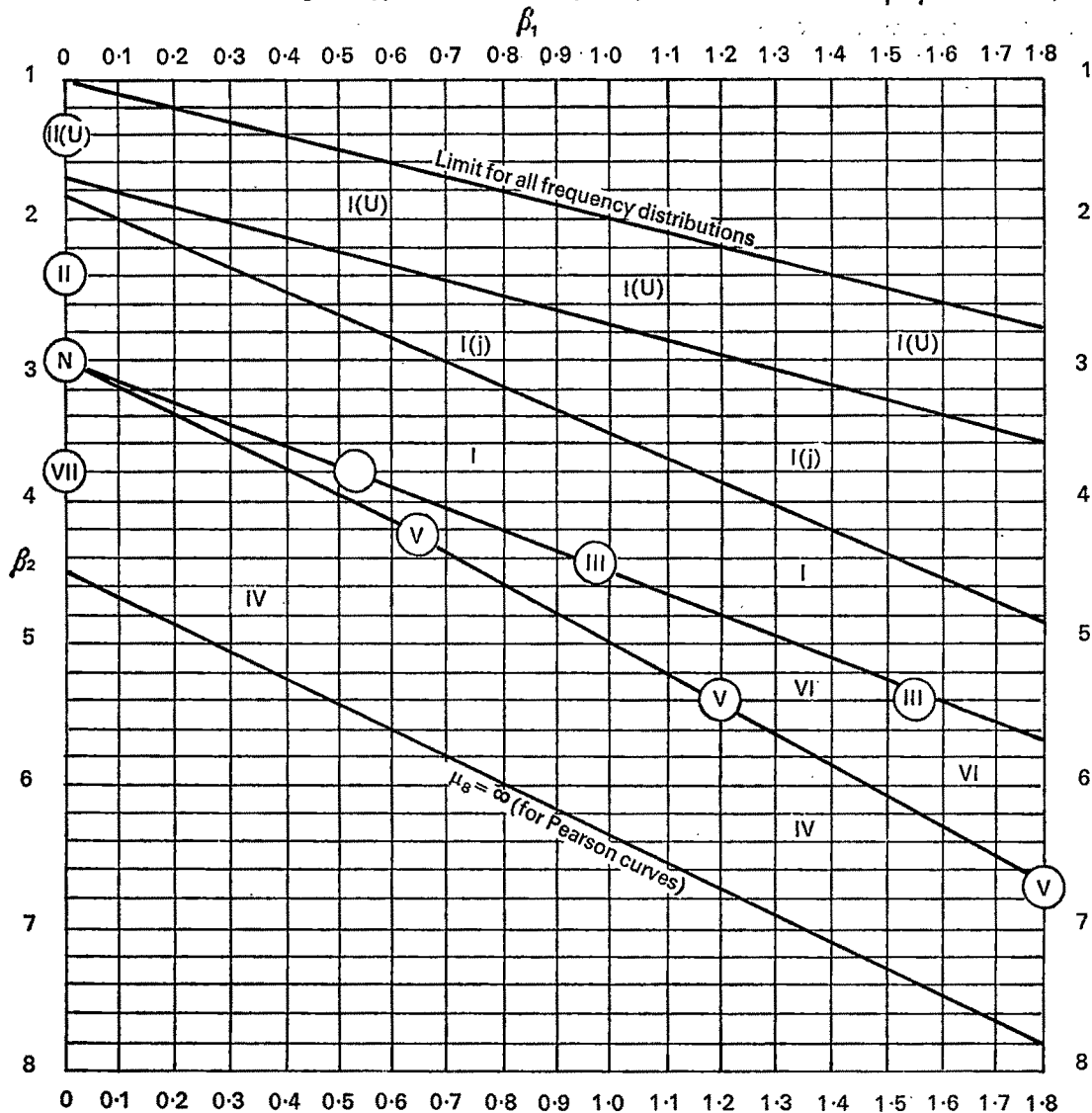
¹⁶ Ibid, p. 197.

TABLE 8¹⁶

Comparison of Pearson and normal density critical areas

| | Lower | | | Upper | |
|---------------------------------|-------|-------|------|-------|------|
| | 0.5% | 5.0% | 5% | 0.5% | 0.5% |
| Pearson curve (Type IV) approx. | -1.95 | -1.41 | 1.82 | 3.33 | |
| From 'normal' probability scale | -2.58 | -1.64 | 1.64 | 2.58 | |

CHART 1*—Chart relating the type of Pearson frequency curve to the values of β_1, β_2 .



Equations of bounding curves

Upper limit for all frequency distributions: $\beta_2 - \beta_1 - 1 = 0$.
 Boundary of I(J) area: $4(4\beta_2 - 3\beta_1)(5\beta_2 - 6\beta_1 - 9)^2 = \beta_1(\beta_2 + 3)^2(8\beta_2 - 9\beta_1 - 12)$.
 Type III line: $2\beta_2 - 3\beta_1 - 6 = 0$.
 Type V line: $\beta_1(\beta_2 + 3)^2 = 4(4\beta_2 - 3\beta_1)(2\beta_2 - 3\beta_1 - 6)$.
 Line on and below which $\mu_8 = \infty$ (for Pearson curves): $8\beta_2 - 15\beta_1 - 36 = 0$.

*Pearson and Hartley (1966, p. 231))

significantly affect the inferences drawn from the sample data, and for that reason the skewness and kurtosis information should be recognized and used to glean a better description of the test situation.

There are, however, differential sampling costs involved in electing the Pearson family as the hypothesis testing construct, owing to the fact that the

normal density is relatively more powerful.¹⁷ The power of a statistical test shows the conditional probability of rejecting a hypothesis (H_0) as a func-

¹⁷ Recall four parameters must be estimated requiring an increase in sample size to attain the same confidence level as could be attained with the normal density. (See Kendall and Stewart, *op. cit.* p. 154.)

tion of the parameters estimated *and* the number of items sampled. Therefore, the manager must ascertain, based upon the skewness and kurtosis, the cost of erroneous decisions as compared with the sampling cost differential.

In some cases the normal or Pearson functions may not be the appropriate density selection. For example, the continuity property or the random variable domain assumption may not be valid. When the property or assumptions underlying the density tests are inappropriate, distribution-free method may be the appropriate choice.

Distribution free statistical tests: A non-density alternative

A number of researchers¹⁸ have suggested a distribution free approach to extracting inferences from sample data. These distribution-free methods (also referred to as non-parametric statistical tests) do not require assumptions about the structure of the density function (i.e., normal, Pearson, etc.). The sample data is combinatorially processed and inter-

sample group comparisons are made to set the level of confidence and test the constructed hypotheses. The essential difference between the distribution tests, which assume that the underlying population is characterized by some specific density, and distribution-free methods lies with the power of the test. For the distribution tests, the power of the test is usually greater, consequently fewer items need to be sampled to attain a specific degree of reliability regarding Type I and II errors. Consequently, to attain the same level of confidence for Type I and II errors, the non-parametric sample size will be greater than the Pearson Curve density function which in turn requires sample sizes larger than the classical density tests. This difference decreases as the number of sample elements increases. (See Figure 4.)

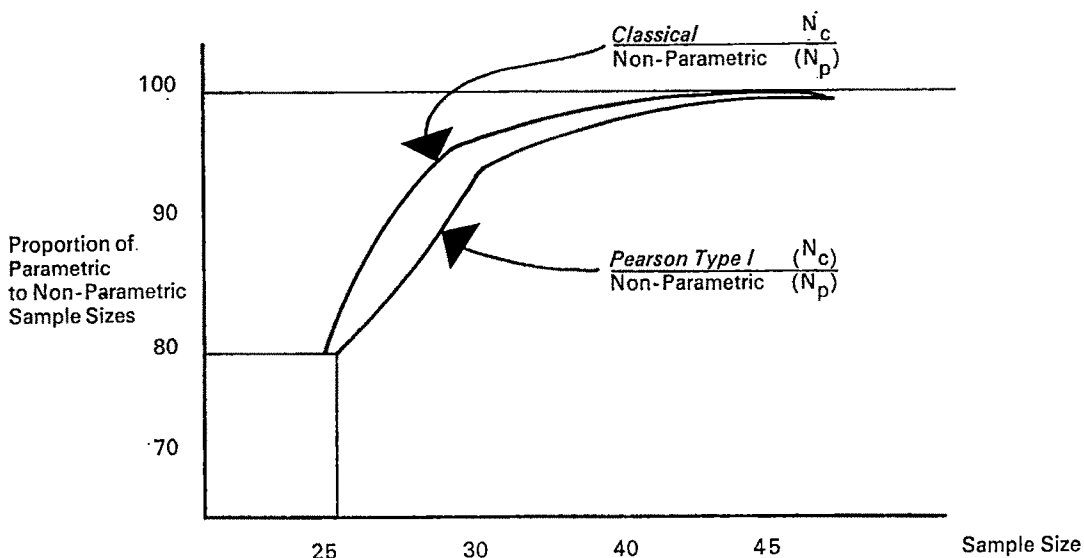
The next stage of development of this research may be to attempt to draw this rather disjoint set of insights into a logical synthesis of decision rules existing on three dimensions:

- (1) The various statistical tests affected by skewness and kurtosis: Test of means, analysis of variance, F tests, X^2 tests, correlation analysis, etc.;
- (2) The decision cost of the unanticipated confidence alterations, and
- (3) The normal density, Pearson densities and distribution-free methods.

¹⁸ Notably: Bradley, James V., *Distribution-Free Statistical Tests* (Prentice-Hall, 1968), Fisher, R. A., *Proceedings of the London Mathematical Society*, Series 2, pp. 199-238; Siegel, S., 'Non-Parametric Statistics', *American Statistician*, vol. 11, 1957, pp. 13-19.

FIGURE 4

Relationship Between the Number of Sample Units: Classical, Pearson Type I, and Non-Parametric Test for the Difference in Population Means



We suggest this as a topic for further research. However, we will present a table indicating how the Pearson, normal and non-parametric tests rate one to the other on a number of criteria.¹⁹ (See Table 9.)

Conclusion

Given that the managers of an organization attempt to control their organization processes, the manager must be cognizant of the trade-offs that should enter into the decision as to the type of sampling program utilized. We indicated that electing the normal density function to test hypotheses when there exists non-normal skewness and kurtosis interjected an unanticipated uncertainty. To evaluate this alteration, it was suggested that the affect of this alteration must be evaluated against the costs of erroneous decisions.

To provide an alternative to the normal assumptions, we suggested the Pearson family of curves which use all four moments to test hypotheses. It was also indicated that the efficiency of the Pearson density function was less than normal density. In those cases where the Pearson and the normal curves seem inappropriate, distribution-free methods were investigated. The trade-off among these three statistical methods relates to the power of the test relative to the particular decision/sampling situation. Since generalities about these trade-offs were considered beyond the scope of this paper, we presented a table which summarized the relative trades among these methods.

¹⁹ This rating was based upon researching the following literature: Box, G. E. P., *op. cit.*; Bradley, J. B., *op. cit.*; Davies, D. L., *op. cit.*; Fisher, R. A., *op. cit.*; Geary, R. C., *op. cit.*; Maun, H. B., *Analysis and Design of Experiments* (Dover Publications, New York, 1949), chapters 1-3; Neyman, J. and Pearson, E. S., *Biometrika*, vol. 20A, pp. 175-240 and 263-294; Scheffé, *op. cit.*, and Siegel, *op. cit.*

It must be emphasized that electing one of the suggested alternatives will not alter the 'reality' of the situation; however, it will enable the reality of the situation to be accurately described. By having a better description of the problem situation, the decision-maker may be able to plan co-ordinate, and evaluate the resources committed to support particular control programs.

Appendix A

Capturing these two conditions in a mathematical model one determines the following differential equation:

$$(1) \quad yx + \dot{y} = 0$$

$$\text{where: i) } \dot{y} = dy/dx$$

$$\text{ii) } y = f(x)$$

An intuitive appeal for the above can be had if one considers reformulating the differential equation $yx + \dot{y} = 0$ to be

$$(1.a) \quad dy/dx = -yx$$

The two conditions mentioned above (pp. 133-4) require that dy/dx (the slope of the function) be zero at three points are:

$$(1) \quad \text{at the mean value } f'(\mu) = 0.$$

$$(2) \quad \text{at the positive limit of } x \text{ where } f'(\infty) \text{ (and } f(-\infty) \rightarrow 0.$$

$$(3) \quad \text{at the negative limit of } x \text{ where } f'(-\infty) \text{ and } f(-\infty) \rightarrow 0.$$

The idea now is to solve for y . The reader should think of dy as a small (infinitesimal) change in y and dx as a similar change in x .

$$\text{Dividing 1.a by } y: dy/dxy = -x$$

$$\text{Multiplying by } dx: dy/y = -x dx$$

$$\text{Integrating: } \log(y) = x^2/2 + k$$

$$\text{Exponentiating: } g(x) = y = k e^{-x^2/2}$$

Now, since $g(x)$ is one which generates the probability of an occurrence, the sum of all probabilities must be 1. This means this particular

TABLE 9

Ranked criteria (1 = preferred, 2 = next preferred, 3 = least preferred based upon the specific criteria)

| Criteria | Normal | Pearson Family (I-VII) | Non-Parametric |
|---|--------|---------------------------|----------------|
| Simplicity of derivation | 1 | 2 | 3 |
| Ease of application | 1 | . | . |
| Speed of Application: | | | |
| Manual (small samples) | 2 | 3 | 1 |
| Computerized | . | . | . |
| Statistical efficiency | 1 | 2 | 3 |
| Choice of significance levels | 1 | 2 | 3 |
| Logical validity of rejection Region | 3 | 2 | 1 |
| Sample size required | 1 | 2 | 3 |
| Susceptibility to violations of assumptions | 3 | 2 | 1 |
| Scope of legitimate application | 3 | 2 | 1 |
| Robustness | 3 | 2 | 1 |

*Indicates no ascertainable difference.

function $g(x) = k e^{-x^2/2}$ must be made to sum to one.

The reader is asked to remember that the changes in x are infinitesimally small so that to sum $k e^{-x^2/2}$ one would integrate that function over its range to determine a value for k .

If one were to perform this integration,

$$\int_{-\infty}^{\infty} g(x) dx = \int_{-\infty}^{\infty} k e^{-x^2/2} dx$$

One would find this integration equal to

$$\int_{-\infty}^{\infty} k e^{-x^2/2} dx = k\sqrt{2\pi}$$

Therefore, the constant term to force the function to be a probability density function is $1/\sqrt{2\pi}$. The function $f(x)$ using the constant $1/\sqrt{2\pi}$ is a proper probability density function. This function is:

$$f(x) = 1/\sqrt{2\pi} e^{-x^2/2}$$

This reader will recognize as the normal distribution with mean 0 and variance 1.

The reader will further remember that the z transformation is one that transforms *any* normal distribution with mean μ and variance σ^2 to a normal distribution with mean 0 and variance 1.

Financial Planning Models Incorporating Dividend Growth Elements

John R. Grinyer

Introduction

This article discusses the case for the use of multi-dimensional planning models for the analysis of data relating to financial aspects of major decisions contemplated by public companies.

The writer contends that, given the existing share ownership structure, management is well advised to consider the impact of its decisions on shareholders' wealth – but that such impact is likely to differ between shareholdings, so that a single criterion of acceptability for major projects is not likely to prove adequate.

Dividend growth is considered as a possible proxy objective of management, and it is concluded that it could prove a useful single proxy for a number of separate measures.

A brief discussion of a simulation model, incorporating dividend growth, constructed by the author then follows as an indication of a possible way in which a dividend growth measure could be used.

Management's Objectives and Shareholder Wealth Generation

It seems realistic to suggest that the average top manager of a public company is primarily motivated by a desire to satisfy personal, and possibly organisational, goals rather than to maximise the wealth of that unknown group of people who are the shareholders.

Both financial theory and this paper are based on the assumption that management would wish to analyse financial aspects of decisions by reference to shareholder wealth, and in view of the appeal of the suggestion in the preceding paragraph it seems necessary to consider whether such an assumption seems valid. It could be claimed to be at least consistent with the personally orientated management goals hypothesised above if

- (a) existing and potential shareholders are able to influence the future position of the managers and organisation

- (b) such shareholders are sufficiently sophisticated and in receipt of sufficient information to make a reasonable evaluation of the shareholder wealth generation prospects of the company, under shareholder wealth orientated management, and the extent to which management is acting to realise those prospects – i.e. that they are able to evaluate how well management is meeting their objectives in holding the shares, assumed here to be purely financial objectives.

Given (a), the existence of (b) would imply that failure of management to act reasonably consistently with the shareholders' interests would lead to shareholder action which involved unpleasant consequences for the top managers and possibly other members of the existing organisational structure.

Existing and potential shareholders are able to influence the future position of the organisation in a number of ways, including direct intervention by means of appointments to the Board of Directors and indirect intervention such as sale or purchase of shares affecting share price and thereby affecting both the availability to the company of future funds raised by share issue and the desirability of the company to a potential takeover bidder and therefore its vulnerability. Given the possibility of takeover, maintenance of an adequate share price and retention of the loyalty of the majority of shareholders may be pre-requisites for maintenance of control by the existing managements of many companies and therefore for the satisfaction of any of their personal or organisational goals. One may therefore be justified in concluding that condition (a) above generally holds.

J. H. C. Leach, in a recent article¹, notes that institutional investors held, at the end of 1970, 35.5% of the quoted equity capital of "UK Registered and

¹The role of the institutions in the U.K. ordinary share market' – *The Investment Analyst*, December 1971.

Managed Companies" – excluding investment trusts to avoid double counting. Leach indicates that during 1970 institutional transactions through the stock market accounted for nearly 39% of total turnover – comprising 46% of the purchases and 31% of the sales. It appears from these figures that the institutions hold a very considerable proportion of the total shareholding, and one which has immense power when one considers that it is the marginal transactions in the stock markets which establish share price.

Does the large scale of institutional activity in the stock markets for equity shares mean that condition (b) is met? It could, perhaps safely, be assumed that institutional investors are fairly sophisticated – but it is perhaps more doubtful whether the information available to them is sufficient for them to forecast adequately company prospects for shareholder wealth generation. Perhaps a reasonable assumption would, however, be that information available to the institutions over time does allow them to form a fairly accurate picture of management's attitudes in decision making and of possible trends in wealth generation. If management makes such an assumption it is probably sufficient, given the powers claimed above as resting with shareholders, to motivate it – in furtherance of the personal objectives of the managers – towards adoption of shareholder wealth creation measures for evaluation of alternative business opportunities.

The weighting given by management to achievement of different objectives seems likely to vary over time and according to the particular circumstances facing the company at the times of taking decisions. Similarly weightings may also vary dependent on the forecast outcomes of different possible courses of action being considered. It can therefore be argued that the most useful models for processing financial forecasts concerning major decisions are not optimising algorithms, but simulation models which project outcomes by reference to several, incommensurate, measures and leave management to decide which of alternative sets of outcomes it prefers. If this argument is accepted it becomes necessary to identify the measures which seem most appropriate for analysis of the financial implications of possible decisions.

Shareholder Wealth Maximisation

In view of the foregoing it would seem useful for management to measure the desirability of alternative decisions in, at least, the dimension of shareholder wealth generation. It might, therefore, be useful to consider how such wealth might be measured. One way, which has the appeal of economic logic, is that the wealth attributable to ownership of a share is:

$$W_0 = \sum_{t=1}^j \frac{ED_t}{(1+r)^t} + \frac{ES_j}{(1+r)^j}$$

where W_0 is the present value of the wealth derived by the existing shareholder from holding the share.

ED_t is the expected value of the cash dividend, net of tax, paid at the end of period t .

j is the period of sale of the share

ES_j is the expected value of the sale proceeds at the end of period j – sale being assumed to take place immediately after the payment of the dividend for period j .

r represents the opportunity cost of the return on investment in other securities of an equivalent risk, and includes a premium for risk.

Underlying this model are a number of assumptions and a body of economic logic. It is not the writer's intention to review these here as they have been discussed at length elsewhere².

The equation is only an approximation to welfare measurement as it could be conceptually unsound³ because it fails to deal adequately with risk and the disutility of risk – for it assumes that both compound over time when it inflates the discount rate to reflect these factors. The theoretical superiority of some alternative approaches seems unlikely to remain in practice given the difficulties of estimating the individual year values required under most models. It will therefore be assumed that the above equation provides a valid description of the value of owning one share.

In making its financial evaluations it would seem, from the above, that management might wish to consider both future dividends and future share prices – which are capable of measurement on the same basis under certainty because then share price would logically be the present value – at the time of sale of the share – of dividends to be paid after the date of sale. Under the uncertainty generally prevailing in the real world the share price, which is set by market transactions and therefore reflects the expectations of the marginal investors, may be a very imperfect reflection of the present value of future dividends. If management wished to use a decision model based on the reasoning underlying the above equation it would need, therefore, to consider the likely changes in the expectations of investors resulting from the information which they would receive during the period under consideration for planning purposes. Knowledge of

²Eg. J. T. S. Porterfield 'Investment Decisions and Capital Costs'. Prentice Hall, 1963.

³See A. A. Robichek and S. C. Myers, 'Optimal Financing Decisions'. Prentice Hall, 1965.

the findings of empirical studies on share prices could therefore be useful.

The Determinants of Share Price

Most empirical models of the determinants of share price have used multiple regression analysis. An example of such analysis in connection with the UK market is the study conducted by G. R. Fisher⁴. The variables which he considered and his conclusions were as follows:

1. the last declared dividend – which he found explained between 59% and 74% of share prices investigated for 1955,
2. retention from the last declared profit – which appeared to have a significant effect on share prices, but one which was usually markedly less than that of the dividend,
3. weighted average annual past growth of dividends – the effect on share prices of which appeared to be both insignificant and uncertain,
4. size of company – the results of the analysis appeared to improve when size was taken into account. This seemed a stable influence over time.

Fisher's findings for the UK market are similar to those found by many researchers in the USA⁵, the general result being that the analyses imply that share prices are influenced to a far greater extent by dividends than by retentions. It is, however, often recognised that there is a possibility of statistical bias in the analyses, that significant variables may have been omitted and that the results are capable of differing interpretations.

Two possible, and conflicting, views are:

- (a) that dividend policy affects share price, and that an increase in dividends will increase share price.⁶
- (b) that dividend policy is, in the long run, irrelevant – as share price is based on expectations of earnings. Modigliani and Miller⁷, who take this view, do however imply that current dividend may have a short-term effect on share price by arguing that it may have an "informational content" – i.e. that investors may assume that changes in dividend amounts

indicate changes in management's expectations of long-run maintainable profits.

If one can accept the validity of the idea of the information content of dividends it seems to the writer that the differing views above are not necessarily in conflict so far as consideration of the effect of dividend policy is concerned. The "informational content" idea must imply that changes in dividend do affect short-run share prices – the irrelevance argument then being that share price will only remain at the changed price if profits over the longer run justify it.

Empirical work on dividend policies in the UK⁸ and the USA⁹, indicates that it is likely that the majority of companies follow a policy of paying stable dividends; dividends will increase – with a lag – when management thinks that maintainable profits have increased, but will be held constant (if at all possible) in the event of a downward revision of managements' profit expectations. Given these findings it seems rational behaviour, on the part of investors, to assume that dividends do have an informational content, and if investors do make such an assumption it is reasonable to assume that they will act upon it with the result that share price changes will be positively correlated with dividend changes¹⁰. This paper will continue on the assumption that share price changes are positively correlated with dividend changes, and also with changes in profit.

Possible Conflicts of Interest Between Shareholders

It has been argued above that management would wish to analyse likely outcomes of its decisions by reference to shareholder wealth, and that such wealth could be expressed as:

$$W_0 = \sum_{t=1}^j \frac{ED_t}{(1+r)^t} + \frac{ES_j}{(1+r)^j}$$

Our discussion on determinants of share price implies that ES_j is likely to be subject, at least to some extent, to influence by management via its dividend decision.

⁸E.g. R. J. Briston and C. R. Tomkins, 'The Impact of the Introduction of Corporation Tax Upon the Dividend Policies of UK Companies', *Economic Journal*, September 1970.

⁹E.g. J. Lintner, 'Distribution of Incomes of Corporations among dividends, retained earnings and taxes', *American Economic Review*, Papers and Proceedings, 1956.

¹⁰It is possible to find examples in which this has not been so – e.g. the price of Lesney Products Ltd. shares fell substantially during 1970 despite an increased dividend in that year. These apparent contradictions are presumably the result of a substantial re-appraisal, by the market, of a company's prospects (a re-appraisal which has been based on information other than dividends). For example, in the case of Lesney the market appears to have changed its assessment of the firm's competitive position. As special factors may be operating in such cases they are, perhaps, not sufficient to rebut the conclusion reached above.

⁴G. R. Fisher, 'Some Factors Influencing Share Prices', *Economic Journal* (1961).

⁵See for example – M. J. Gordon, 'Dividends, Earnings and Stock Prices', *Review of Economics and Statistics*, May 1959. B. Graham, D. L. Dodd and S. Cottle, 'Security Analysis', McGraw Hill, 1962.

⁶M. J. Gordon, 'The Savings, Investment and Valuation of a Corporation', *Review of Economics and Statistics*, February 1962.

⁷M. H. Miller and F. Modigliani, 'The Cost of Capital, Corporation Finance, and the Theory of Investment: Reply', *American Economic Review*, September 1959.

As it is based on investor expectations, and such expectations may not accord with those of management, it seems unlikely that share price would adequately reflect management's expectations of future cash flows.

The equation indicates that the relative significance, to the shareholder, of dividends received and share price at the time of sale differs depending on the length of time for which he will hold the share. As the period lengthens the present value of the future dividends increases and of the proceeds of the share sale declines, because of the operation of the discount factor.

As share prices appear to be influenced by dividend and profit flows it seems that different patterns of such flows, having equal present values of future dividend flows over the planning period, could give rise to different variations in share price and therefore to differing shareholder preference for those flows depending on when the shareholder sells his shares. This argument could be extended to claim that the acceptance of the present value criterion frequently used in project appraisal could adversely affect the interests of some shareholders, and this could be illustrated as follows:

Company AB Ltd. has projected after Corporation Tax cash inflows from its existing business of £100,000 per annum to infinity – all of which will be distributed as dividend on the 1,000,000 Ordinary Shares issued unless invested in new projects. There are no Preference Shares.

Management is considering two mutually exclusive projects –

Project A which would give rise to a net cash inflow of £20,000 per annum to infinity and
Project B which would give rise to a net cash outflow of £10,000 per annum for 5 years followed by a net cash inflow of £50,000 per annum for year 6 to infinity. All flows are after Corporation Tax, and any net cash outflows will be met from internally generated funds. The firm will distribute all available cash as dividends.

The market rate of discount on the firm's dividend flows is 10% on a before Schedule F Tax basis.

Discounting the cash flows at that rate

Project A has a present value of £200,000 and
Project B has a present value of £232,000 approximately, so that on a conventional NPV analysis Project B appears to be the preferable alternative.

If project A is accepted annual dividends would be £120,000 in total. As there are no retained earnings, and assuming that the market capitalises the last declared dividend at 10%, the share price for years 2 onwards would be £1.2 per share (until further de-

cisions were made altering the cash flows).

If project B were accepted the dividend flows for years 1 to 5 inclusive would be £90,000, which would give rise to a share price for years 2 to 6 of £0.9 per share (on the basis of capitalising the last declared dividend at a rate of 10%, which assumes that investors are either unaware of, or ignore, the prospective future increase in dividends). Years 6 to infinity would have dividend flows of £150,000 leading to a share price for year 7 onwards of £1.5 per share on the basis of the simple dividend capitalisation share valuation model adopted for this illustration.

If project A is accepted all shareholders obtain (at the 10% discount rate) a present value of £1.2 per share regardless of when they sell after year 1.

If project B is accepted the present value of owning a share varies – dependent on when the share is sold – as follows:

| <i>Present Value per share</i> | | | |
|--------------------------------|------------------|----------------------|--------------|
| | <i>Dividends</i> | <i>Sale Proceeds</i> | <i>Total</i> |
| | £ | £ | £ |
| Sale in year 1 | — | 1.0000 | 1.0000 |
| „ 2 | 0.0818 | 0.8182 | 0.9000 |
| „ 3 | 0.1562 | 0.7438 | 0.9000 |
| „ 4 | 0.2238 | 0.6762 | 0.9000 |
| „ 5 | 0.2853 | 0.6147 | 0.9000 |
| „ 6 | 0.3412 | 0.5588 | 0.9000 |
| „ 7 | 0.4260 | 0.8468 | 1.2728 |
| „ 8 | 0.5030 | 0.7698 | 1.2728 |
| Sale thereafter | | | 1.2728 |

It is assumed that sale of shares takes place at the beginning of each year, immediately following payment of the previous year's dividend.

On the assumptions made, shareholders who sell between years 2 and 6 inclusive would be £0.3 per share better off with project A than with project B (indeed they would be better off with the existing streams than with those streams altered on the acceptance of project B). Shareholders who retained their shares beyond this period would be £0.07 per share better off in present value terms if project B were accepted.

The above is a highly simplified example and in practice one would anticipate fluctuating cash flows and share prices, which would give rise to even more complex variations between the interests of different shareholders. It does however highlight the possibility of conflict between such interests when the firm's investment decisions are concerned – if the implications of the empirical studies are accepted.

When making their decision the management of AB Ltd., in the above illustration, would have to decide which group of shareholders was to receive preferred treatment. This would presumably be a subjective decision on their part and it seems con-

ceivable that they would have been prepared to sacrifice present value of £0.07 per share on longer term shareholders' stock to gain £0.30 per share for short term shareholders. If management anticipated embarrassment consequent on a fall in share price, which seems possible, this would presumably strengthen any tendency which it might have to give precedence to the interests of the short term shareholders. Using this reasoning the discounted cash flow analysis would have given the wrong ranking decision in this example.

As the significance of the sale price to the net present value of holding a share declines as the period for which the share is held lengthens (because of the operation of the discount factor) it could be claimed that the Net Present Value method of evaluation is likely to give a reasonably correct analysis so far as very long term shareholders' interests are concerned¹¹, and for this reason it seems to the author that it must feature as part of the information presented to management in respect of a financial decision. It may be useful, however, to extend the analysis to incorporate some measure of the welfare of short and medium term shareholders – that is those shareholders who will sell their shares well within the time horizon envisaged for decision purposes by management.

A Policy of Compromise

If no attempt is made to smooth the dividend pattern it seems likely that share price will fluctuate for most companies. This would mean that the interests of shareholders selling in each year will probably differ from those of all other shareholders.

It is possible that the most satisfactory policy for furthering the interests of the majority of short and medium term shareholders would be one designed to achieve a stable trend of dividends, preferably growing over time at the maximum maintainable rate. The stability should help to stabilise share prices so that there was less likelihood of some shareholders losing by reason of marked downward fluctuations in price and could also help to increase long run share price if it resulted in a reduction in the market rate of discount applied to the firm. The growth should mean that, within the constraint of the achievement of stability, the shareholders received a growing measure of wealth from their share ownership – both by way of cash received as dividends and by way of increase in share price.

¹¹The net present value method will give the correct answer if shareholders do not sell their shares until the end of the life of the project being evaluated – subject, of course, to the usual reservations about the accuracy of the cash flows and of the discount rate.

This can, under very limiting assumptions, be illustrated as follows:

Assume that the firm will maintain a stable compound rate of dividend growth and that share price is a function only of past dividends. Then the net present value of share ownership could be shown by the formulation:

$$W_o = \frac{D_o(1+g)}{1+r} + \frac{D_o(1+g)^2}{(1+r)^2} + \frac{D_o(1+g)^3}{(1+r)^3} + \frac{aD_o(1+g)^{n-1}}{(1+r)^n}$$

in which W_o is the net present value

D_o is the last declared dividend

g is the constant compound rate of dividend growth

r is the shareholders' opportunity cost of capital

a is the coefficient which when multiplied by the last declared dividend gives the share price – 'a' being assumed here to be a constant over time¹²

n is the year of sale of the share.

The last term in the equation is the present value of the sale proceeds, and the preceding terms indicate the present value of dividends in all years prior to sale – which sale is assumed to take place before the declaration of the dividend for year 'n' the year of sale.

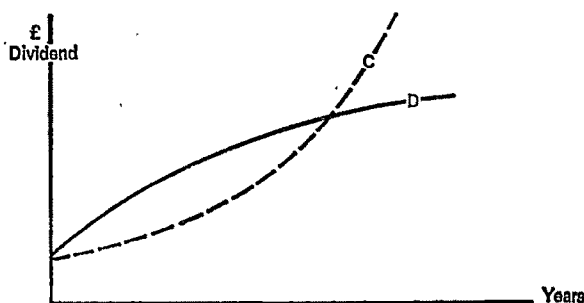
Assuming that management wishes to keep 'g' constant over time, and that all other terms will remain constant over time, then every shareholder will maximise the present value of his shareholding subject to the given constraints if the rate of growth 'g' is maximised.

Unfortunately this analysis is not proof of the optimality of a policy of maintenance of a compound rate of dividend growth, because it is made on the vital assumption that management wishes to maintain a constant compound rate of growth – and this may not be reasonable.

Consider the following diagram in which line C represents the maximum dividend flows possible with project "C",¹³ given the usual cash and legal constraints, and line "D" represents the maximum dividend flows possible with project "D". Assume

¹²The share valuation model implied here differs from that used in the example of A.B. Ltd., in which 'a' was $1/r$ and it was implied that investors expected A.B. Ltd. to generate constant dividends (rather than growth of income). The present model assumes constant dividend growth and one would therefore expect 'a' to have a value greater than $1/r$.

¹³The definition of project in this sense would include a portfolio of investment projects, together with their associated finance.



that the compound rate of dividend growth possible with "C" is higher than with "D", but that the net present value per share with the latter project is higher than with "C".

It could be argued that the possible rate of increase in dividends with project "D" is much greater in the early years than with project "C" – indeed that the constant compound rate of increase is not particularly important and that what is important is the speed with which dividends can be established at a particular level (and therefore presumably with which share price can be established at the amount applicable to that level) provided that they can be at least maintained at the level achieved. In the example above it could be that project "D" is the one which provides the greatest wealth for both short term and long term shareholders and is therefore preferable to project "C" – although the latter has the higher constant rate of compound growth of dividends over a long time period.

The above argument appears to be a valid one and could mean that an objective of maximising the constant compound rate of growth of dividends is not a wise one for management to adopt if it involves an attempt to achieve a constant rate over a long time period. The argument does not necessarily indicate that management is unwise to use the maximisation of a constant compound rate of growth over a short time period (say three to five years) as an objective, because this time period would be sufficiently short to give rise to preference, on growth grounds, of type "D" projects to type "C" projects. It appears therefore that a management objective of maximisation of the compound growth of dividends over the next few years is probably a sensible one.

A further reason why managements might like to consider compound dividend growth rates achievable with alternative decisions is that there is evidence that they prefer to be cautious when increasing dividends. Lintner's studies have indicated that many managements are reluctant to increase dividends if there is a possibility that they might subsequently have to reduce them. Compound growth rates would

indicate the acceleration in amounts by which dividends could increase from year to year – and selection of projects on the basis of such rates should, therefore, give rise to a greater measure of confidence on the part of management that having raised dividends they can maintain them.

Achievement of smoothed dividend growth would presumably mean that there was a greater likelihood of all shareholders benefiting from ownership of their shares – although this might only be accomplished at the cost of some not benefiting as much as they could have in the absence of such a policy. It seems possible that many managements would be prepared to accept such a cost for the advantages which may arise for the short and medium term shareholders.

It is conceivable that management might wish to achieve a compromise solution to the problem of conflicting shareholder interests by working with a share valuation model. One such approach might be to calculate the expected effects of decisions on dividends and retentions and thence the anticipated resulting share prices in each year.¹⁴ The present value of ownership of shares sold in each year could then be calculated and management could decide which alternative gave rise to the preferred pattern of values.

It seems possible that in practice management tends to think in terms of a satisficing model so far as shareholders are concerned. If this is so then it could be that the type of approach discussed in the preceding paragraph is very appropriate to management's needs, and it could be incorporated readily into a simulation model. Possibly there is no general analytical model suitable for the managements of all companies and each will require models modified to suit its particular objectives.

Relevant Measures for the Analysis of Financial Decisions

What information is relevant to management evaluation of major financial decisions? If it is assumed that management may consider that it may not always be able to obtain additional funds as it requires them, then it seems likely that it would like information on expected liquidity over time arising under alternative decisions.

Research¹⁵ has shown that investors take notice of annual accounting statements – and presumably use them in evaluating the management of a firm. The

¹⁴Professor B. V. Carsberg discussed this approach at a seminar held at the London School of Economics in 1970.

¹⁵E.g. For a study in the USA see W. H. Beaver, 'The Information Content of Annual Earnings Announcements', Vol. 6, *Journal of Accounting Research*; and in the UK a study of a rather different type – 'Information for Investment Decisions', by Sandra Mason, *The Investment Analyst*, September 1971.

research on share valuation models, e.g. Fisher's work quoted above, also implied this because of the significance attaching to the figure of retained earnings. It seems, therefore, that management is likely to require information on the pattern of accounting profits arising with each major decision. This does not necessarily imply that such profits are meaningful in themselves – merely that they are thought to be viewed by investors as meaningful.

Information about the maximum compound rate of dividend growth expected to be maintainable over a specified number of years after the adoption of a project should, if the arguments in this paper are valid, also prove useful. It is interesting to note that this single measure is influenced by both some aspects of liquidity and of accounting profitability if calculation of growth rates is made under dividend cover constraints (cover being calculated both in terms of profit and cash).

The discussion earlier in this paper suggested that the net present value of future dividends might be a useful measure for establishing the values, to long-term shareholders, of alternative courses of action. Management would therefore probably wish to know the estimated outcomes of projects expressed in terms of such values.

No doubt there would be a management requirement for information of a non-financial nature in connection with each major decision of the firm. As this paper is concerned solely with financial management aspects of decisions such requirements will not be discussed here.

Output From Some Simulation Models

The author has constructed some computer simulation models to test the feasibility of providing the information outlined above. These models simulated the outcomes of adopting different investment alternatives under two dividend policies, the first of which assumed that maximum dividends would be paid each year (i.e. that there would be no attempt to smooth the dividend stream over time), and the second of which assumed that the dividend stream would be smoothed to achieve the maximum compound rate of dividend growth over a specified period.

For both policies the models calculated:

- (1) the net present value per share of after tax dividend figures derived after the imposition of constraints for cash availability and profit cover;
- (2) the figures of annual profit which would arise, given the dividend policy and assumptions of the rate of return possible on re-invested funds, during the planning period;
- (3) the figures of annual cash balances, after pay-

ment of dividends, during the planning period.

Comparison of the net present value figures, mentioned in (1) above, for a single investment alternative provides a measure of the anticipated loss to long-term shareholders from pursuing a policy of compound growth of dividends over the period specified for the model.

A better appreciation of the approach taken may be obtained if we consider one of the models in more detail.

A Model for Capital Rationing

This model would be suitable for use when considering projects that materially alter the cash and accounting profit flows of a firm which considers that it is in a capital rationing situation. It combines the cash and profit flows of each of a limited number of investment projects to obtain such flows for each possible combination of the considered projects. Flows for each combination are then aggregated with the projected cash and profit figures arising from the existing business (and with cash receipts from sources external to the company in cases in which management considers that such receipts will arise) and the output listed in the preceding section is printed for each possible combination of projects.

As a summary of results, the computer prints lists of present values of dividends and scatter diagrams of such present values and of maximum rates of compound dividend growth possible with each project combination.

Input to the computer on a test run is shown in Appendix A, while Appendix B shows an example of computer output from the model for two of the possible project combinations.

It can be observed, from the output shown in Appendix B, that management's choice between the two portfolios represented would depend on whether it preferred the best possible reflection of its activities to arise in the long or short run. If it considered that the first three years were the most important, then it would prefer project 2 to the combination 2, 3 and 6, although the latter would provide higher accounting profit, and potential dividend growth, from year four onwards and also greater net present values. Conversely, decisions taken with the longer term consequences uppermost in mind would lead to the adoption of combination 2, 3 and 6.

The reader will note that the output shown in the Appendix assumes that management would wish to maintain the same rate of dividend growth throughout the total number of years used in the model. This is inconsistent with the argument above that the dividend growth element should be limited to measurement of growth possible over the relatively short term.

Adjustment of the model to achieve management's desires in this respect would be a fairly simple matter.

Clearly, detailed examination, by management, of the computer output relating to each of the possible combinations would make decisions difficult, if not impossible. Fortunately this is unnecessary, because the summary information printed (outlined above) enables the majority of combinations to be rejected as being dominated in all respects by other combinations. This leaves comparatively few combinations, i.e. those which are not in all respects dominated by others, for detailed consideration. (For example, out of the sixty-three possible combinations of projects outlined in Appendix A there were only two for which expectations on all measures were not matched or surpassed by those for other projects.)

As previously indicated, the model was developed to show that calculation of the information suggested, in this paper, as being useful for financial evaluation of alternative major decisions facing the firm was well within the scope of simulation models. In its present form it uses a large amount of computer central storage and would, therefore, require development before it could be used by firms having access to equipment with limited capacity.

Conclusion

It seems unwise of management to make financial

decisions on the basis of consideration of only one measure. The outcome of alternative courses of action should, ideally, be estimated and expressed in terms of the several different measures which could provide meaningful information. Management must then decide which set of expected outcomes it prefers, or possibly which set of outcomes it considers that the majority of shareholders would prefer.

The expected future rate of dividend growth possible under alternative decisions seems to be information which could prove useful when choosing between such alternatives, as it can, to some extent, represent a proxy for profit and cash balances and may well indicate the likely direction of movement of share price attributable to the information which investors appear to believe they receive from dividend declarations.

Construction of some computer models incorporating a dividend growth feature has demonstrated that the inclusion of such a characteristic in financial simulation models is feasible, if believed by management to be desirable.

Acknowledgment

The author wishes to thank Professor J. Flower, of Bristol University, for the helpful comments which he made during the preparation of this paper.

Appendix A

Test data for the capital rationing model

Number of years in evaluation – 15 years.

Rate of return on internal re-investment of cash surplus to project and dividend requirements – 20%

Rate of interest for short-term lending – 10%

Dividend cover required – a minimum of 1.

Existing capital not subject to Sch. F tax on distribution – £400,000.

Number of ordinary shares which have been issued – 400,000.

Last dividend declared and paid – £50,000 (gross).

Corporation tax payable in year 1 – £50,000.

Corporation tax rate – 45%.

Terminal value of existing business assets – i.e. those to which the firm was already committed – £300,000.

Cash from sources other than projects or existing business revenue flows:

Year 1 – £100,000

Year 2 – £200,000

thereafter – Nil

Profit flows from existing business (before depreciation)

Years 1 to 15 – £200,000 per annum.

Depreciation figures associated with existing business profit flows:

Years 1 to 15 – £50,000 per annum.

Projects

Five independent projects were considered which, with the inclusion of project 1 (a “dummy” project inserted to evaluate the alternative of rejection of all projects), makes a total of six projects for evaluation. There are, of course, sixty-three combinations of such projects.

The flows associated with the projects are as shown below:

| PROJECT FLOWS | Project 1 | Project 2 | Project 3 | Project 4 | Project 5 | Project 6 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| <i>Cash for capital expenditure</i> | £ | £ | £ | £ | £ | £ |
| Year 1 | Nil | 50,000 | 100,000 | 200,000 | 200,000 | 70,000 |
| Year 2 | Nil | 50,000 | 100,000 | 100,000 | Nil | 100,000 |
| Year 3 | Nil | 50,000 | Nil | Nil | Nil | 200,000 |
| Thereafter | Nil | Nil | Nil | Nil | Nil | Nil |
| <i>Revenue flows</i> | | | | | | |
| Year 1 | Nil | 100,000 | Nil | 50,000 | 60,000 | Nil |
| Year 2 | Nil | 50,000 | 50,000 | 70,000 | 100,000 | 20,000 |
| Year 3 | Nil | Nil | 50,000 | 70,000 | 20,000 | 50,000 |
| Years 4 to 10 inclusive | Nil | Nil | 50,000 | 70,000 | 20,000 | 100,000 |
| Years 11 to 15 inclusive | Nil | Nil | 10,000 | 30,000 | Nil | 100,000 |
| <i>Depreciation</i> | | | | | | |
| Year 1 | Nil | 75,000 | Nil | 20,000 | 20,000 | 37,000 |
| Year 2 | Nil | 75,000 | 20,000 | 20,000 | 20,000 | 37,000 |
| Years 3 to 10 inclusive | Nil | Nil | 20,000 | 20,000 | 20,000 | 37,000 |
| Year 11 | Nil | Nil | 20,000 | 20,000 | Nil | Nil |
| Years 12 to 15 inclusive | Nil | Nil | Nil | 20,000 | Nil | Nil |
| <i>Terminal values</i> (at end of Year 15) | Nil | Nil | Nil | 50,000 | Nil | 200,000 |

APPENDIX B

| YEAR | PROFIT | UNSMOOTHED DIVIDENDS | PROJECTS 2, 3 and 6 combined | SMOOTHED DIVIDENDS | CASH BALANCE |
|--|--------|----------------------|------------------------------|--------------------|--------------|
| | | DIVIDENDS | CASH BALANCE | DIVIDENDS | |
| 1 | 75908 | 64591 | 54100 | 32019 | 74500 |
| 2 | 79899 | 46940 | 146092 | 34900 | 173741 |
| 3 | 120946 | 30297 | 0 | 38041 | 1924 |
| 4 | 148446 | 87212 | 169538 | 41465 | 261484 |
| 5 | 160977 | 94574 | 191198 | 45197 | 319951 |
| 6 | 175108 | 102876 | 230744 | 49265 | 404200 |
| 7 | 189164 | 110546 | 255197 | 53699 | 487216 |
| 8 | 194967 | 115718 | 285539 | 58532 | 563933 |
| 9 | 218071 | 128117 | 352711 | 63799 | 723935 |
| 10 | 231639 | 136079 | 393155 | 69541 | 834811 |
| 11 | 244147 | 143436 | 393728 | 75800 | 928353 |
| 12 | 266453 | 154541 | 402317 | 82622 | 1062223 |
| 13 | 276598 | 162495 | 418782 | 90059 | 1201141 |
| 14 | 286510 | 168324 | 444456 | 98163 | 1365644 |
| PRESENT VALUE OF DIVIDENDS AT .10 RATE | | UNSMOOTHED | 2.5249 | SMOOTHED | 2.5646 |
| PRESENT VALUE OF DIVIDENDS AT .11 RATE | | UNSMOOTHED | 2.3056 | SMOOTHED | 2.2474 |
| PRESENT VALUE OF DIVIDENDS AT .12 RATE | | UNSMOOTHED | 2.1164 | SMOOTHED | 2.0220 |
| PRESENT VALUE OF DIVIDENDS AT .13 RATE | | UNSMOOTHED | 1.9443 | SMOOTHED | 1.8241 |
| PRESENT VALUE OF DIVIDENDS AT .14 RATE | | UNSMOOTHED | 1.7906 | SMOOTHED | 1.6500 |
| PRESENT VALUE OF DIVIDENDS AT .15 RATE | | UNSMOOTHED | 1.6531 | SMOOTHED | 1.4966 |
| MAXIMUM RATE OF COMPOUND DIVIDEND GROWTH | | | .09 | | |

APPENDIX B

| YEAR | PROFIT | UNSMOOTHED DIVIDENDS | PROJECT 2 CASH BALANCE | PROFIT | SMOOTHED DIVIDENDS | CASH BALANCE |
|--|--------|----------------------|---------------------------|--------|--------------------|--------------|
| 1 | 9625 | 56547 | 203750 | 96250 | 33194 | 243500 |
| 2 | 83800 | 60238 | 305571 | 86747 | 37509 | 338827 |
| 3 | 129144 | 70584 | 131593 | 125560 | 42385 | 201599 |
| 4 | 129874 | 74298 | 186140 | 140445 | 47895 | 277892 |
| 5 | 143627 | 84391 | 226667 | 160979 | 54122 | 348025 |
| 6 | 160380 | 94223 | 274451 | 186701 | 61157 | 435618 |
| 7 | 165600 | 97293 | 279160 | 200900 | 69108 | 465280 |
| 8 | 163654 | 94144 | 268005 | 210244 | 78092 | 480654 |
| 9 | 173736 | 102070 | 305134 | 230871 | 88244 | 569038 |
| 10 | 182530 | 107237 | 327879 | 250911 | 99715 | 603302 |
| 11 | 191011 | 111631 | 347046 | 269779 | 112678 | 650201 |
| 12 | 195376 | 114784 | 359835 | 285630 | 127327 | 681584 |
| 13 | 201339 | 118287 | 376458 | 301624 | 143879 | 712761 |
| 14 | 209355 | 122996 | 399829 | 318780 | 162583 | 745456 |
| PRESENT VALUE OF DIVIDENDS AT .10 RATE | | | UNSMOOTHED | 2.2410 | SMOOTHED | 2.2475 |
| PRESENT VALUE OF DIVIDENDS AT .11 RATE | | | UNSMOOTHED | 2.0600 | SMOOTHED | 2.0359 |
| PRESENT VALUE OF DIVIDENDS AT .12 RATE | | | UNSMOOTHED | 1.8988 | SMOOTHED | 1.8492 |
| PRESENT VALUE OF DIVIDENDS AT .13 RATE | | | UNSMOOTHED | 1.7569 | SMOOTHED | 1.6840 |
| PRESENT VALUE OF DIVIDENDS AT .14 RATE | | | UNSMOOTHED | 1.6241 | SMOOTHED | 1.5377 |
| PRESENT VALUE OF DIVIDENDS AT .15 RATE | | | UNSMOOTHED | 1.5106 | SMOOTHED | 1.4078 |
| MAXIMUM RATE OF COMPOUND DIVIDEND GROWTH % | | | | | | .13 |

Book Review

Principles of Model Building *Patrick Rivett.*
(Wiley, £3.10)

In his preface the author tells us that 'the present book is based on lecture courses given at the University of Sussex'. The precise audience is not defined, but one would suppose that the material is intended as a general introduction to postgraduate work in operational research. Certainly, it assumes that the reader possesses 'the basic knowledge which most operational research and management scientists possess'. Starting with this assumption, Professor Rivett proceeds to explain their philosophical underpinning, and the place of models and model-building in scientific method. He goes on to discuss ways in which models might be classified and the strengths and weaknesses of the varying types of model available.

He also devotes an admirable amount of space to discussions of organisational objectives and demonstrates how most of the more 'popular' techniques (which, in general, are those which produce finite, unambiguous answers) achieve their results by both simplifying the variables and constraints to be found in the problem *and* by taking simplistic and tendentious versions of the objectives being pursued. He rightly concludes that deterministic, programming solutions are too often employed where a simulation technique would have been much more profitable.

The book contains a chapter which sets out the problems which the model-builder experiences in dealing with accountants! It would be possible to go through this material and claim that Professor Rivett paints too dark a picture: on the other hand, if we are amateur anthropologists we will recognise that this *is* how our principles and practices tend to appear to outsiders. In any case, the conclusion is simply that no figures should be accepted for model-building without close inquiry into the assumptions made in preparing them; a piece of advice which it would be hard to quarrel with!

Because the mathematical nuts-and-bolts are taken as read, and Professor Rivett writes good, clear English, the book is deceptively simple on first reading. If one is used to more detailed and pretentious expositions of these topics, it is easy to finish the book

and suppose that some arcane aspect of the problem has not been covered: your reviewer jotted down several such items, but consultation of the brief but well-chosen index disclosed their presence in the text. Indeed, it is a salutary exercise for a social scientist to read the book, and appreciate how the same problems are dealt with by other disciplines. For example, one does not find reference to Cyert and March, or to many works in econometrics, and engineers might wonder that Forrester and dynamic systems go unmentioned; but much of the same ground is covered by references in the area of operational research itself.

It may be that consideration of the alternative treatment in these other areas provides some scope for minor adverse criticism. Perhaps more weight should have been given to the difficulties of identifying the significant variables to arrive at a structural model in the first place, and also to the serious consequences of incorrect identification, especially where change is occurring. Again, the author fails to point out how the existence of 'organisational slack' can foul up the tidy linear quantification of any model, by permitting otherwise unobtainable economies to occur in bottlenecks. Finally, a disciple of Forrester might have placed even greater emphasis on the dangers of local sub-optimisation within an essentially dynamic system, both as to place *and* time. The model-builder may stop the world, but he can't really get off.

What has this work to offer the accountant either in academia or in the field? One very definite use for it would be as *part* of the reading for a general introductory course in scientific method for postgraduate students in accounting. At the outset the reviewer has to confess that he does not offer his own postgraduates a formal course of this sort, preferring to convey the material either through exposition of specific points in other courses, or in personal discussion; on the other hand such courses are major features of many American schools. Their advantage in promoting rigorous thought and a purposive approach to graduate research work is obvious, while their more subtle drawback is the elevation of mere 'methodology' to

the status of a subject. It sometimes seems possible totally to ignore the baby, while conducting a meticulous examination of the bath water (a point made more than once in the book itself!).

This caveat as to the possible dangers to the academic of a book on methodology does not mean that it would have similar drawbacks for the man in practice or industry. In general, his opportunities for contemplating his methodological navel are few. Indeed, he may find this book very helpful – it could be subtitled 'Everything you wanted to know about Operational Research – but were too frightened to ask'. As we have seen, the book lays open the soft

underbelly of scientific method in general and would provide the reasonably-informed *user of the results of OR work* with an adequate insight into the assumptions which have gone into it and the probability that they represent a reasonable basis for decision-making. The book is worth its price if it convinces the reader (in Chapter 10) that 'forecasting' based on even the most sophisticated regression analyses of time-series is but the creation of a primitive 'unthinking' model, unless the selection of the independent variables on which the regression is made has *previous* justification in a structural model.

TREVOR GAMBLING

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Volume 3 No 10 Spring 1973

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Accounting and Business Research

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Editorial and Advertisement Offices:

City House, 56–66 Goswell Road, London EC1 Tel: 01-628 7060

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Asset Values and ex post Income

S. J. Gray and M. C. Wells

We wish to take issue with part of the argument presented by Parker and Harcourt (P & H) in the introduction to their book of readings.¹ One section of that introduction is devoted to a discussion of the difficulty of defining, and consequently of calculating, income, particularly in relation to a firm which has assets in its possession both at the beginning and at the end of the period under review. Placing the discussion in this context is important, for otherwise their statement that 'there is . . . a strong argument for a concept of income which uses both entry and exit prices' (p. 17) would amount to a mere truism. The conventional accounting concept of income which involves matching costs (entry prices) with revenue (exit prices) certainly uses both. Similarly, the concept of 'current operating profit' developed by Edwards and Bell² involves the matching of the current entry prices of goods at the time those goods are disposed of with the revenue derived from their sale. But Parker and Harcourt do not consider the propriety of using various entry prices as the debit entry in calculating income.³ Their concern is with the credit side of that calculation. That is, on the grounds that, however defined, the calculation of income will involve the valuation of capital at two points of time, they restrict their discussion to the manner in which assets still in possession at the end of a period (and only consequentially therefore at the beginning of the next period) should be valued.⁴

Further in relation to *ex post* income, only net realizable values and replacement prices are considered to be acceptable alternative valuations. But, as already stated above, these are not seen as exclusive alternatives. The concept of income envisaged by Parker and Harcourt is one which '... uses both entry [replacement] and exit [net realizable] prices'.

Before proceeding to an examination of this concept, it is important that we identify the purposes for which income is to be calculated and capital to be measured. These are purposive activities – if they have no identifiable purposes they are pointless, and, conversely, in the purposes will be found the justification for the concept to be proposed. Parker and Harcourt give two hints as to the purposes assumed by them: '... the past can be of some help in forecasting the future and . . . shareholders and citizens need a report of stewardship from their company or government' (p. 4), and '... useful both for planning and control and for stewardship reporting' (p. 5). With these purposes in mind, consider Parker and Harcourt's argument for a concept of income using both end of period exit and entry prices.

Ex post income

A basic premise of the argument presented by Parker and Harcourt (pp. 17–19) is that 'An upper limit to the value of an asset to a firm is set by its current replacement cost (RC), for the loss which the firm suffers from being deprived of the asset cannot exceed the cost of restoring it to its former position' (p. 17). This is taken directly from Solomons' discussion of 'value to the owner', which rests in turn on Bonbright's *The Valuation of Property*.⁵ But both of those authors were concerned with considerations other than those embraced by the purposes enumer-

¹R. H. Parker and G. C. Harcourt, *Readings in the Concept and Measurement of Income* (Cambridge, Cambridge University Press, 1969).

²Edgar O. Edwards and Philip W. Bell, *The Theory and Measurement of Business Income* (Berkeley and Los Angeles, University of California Press, 1967), pp. 88–97.

³For consideration here would be entry prices such as historical or original cost, price level adjusted historical cost, and current replacement price among others.

⁴This discussion will not be affected by the way in which 'asset' is defined, providing that definition encompasses the property and rights owned by the firm at a stipulated date. Accordingly, following Parker and Harcourt, this paper is restricted to a consideration of the problems of valuation.

⁵D. Solomons, 'Economic and Accounting Concepts of Cost and Value', in *Modern Accounting Theory*, ed. M. Backer (Englewood Cliffs, N.J., Prentice-Hall Inc., 1966), pp. 122–125; James C. Bonbright, *The Valuation of Property* (Charlottesville, Va., The Michie Co., 1965 (Reprint)), pp. 66–97.

ated by Parker and Harcourt. Solomons was concerned with 'the basic material out of which accounting has been and is being built' (S., p. 139), rather than an ideal notion of income for which he appears to favour 'the present value of (an asset's) expected net receipts' (S., p. 123). Bonbright was even further removed from our present task.⁶ His idea of value was in relation to actual cases of deprivation and the consequent claims for recompense or damages. In such cases as, for instance, claims on insurance companies, the policy of recompensing the claimant for the loss he has suffered has long been accepted. That situation is *not* the same as the one under consideration here.

Where a firm is currently in possession of an asset it has obviously not been deprived of it. The loss which might be suffered by deprivation is therefore a secondary consideration to the benefit which the firm expects from the use or resale of the asset. And value of a good in possession implies the latter – voluntary choice in the use or enjoyment of the asset, not an involuntary forgoing or sacrifice which is implied by a 'loss' concept. Indeed, it might be argued that a 'loss' is more akin to a cost – which as Solomons points out (S., p. 118) implies a forgoing or sacrifice – although not involuntarily. For there to be a sacrifice the thing forgone must have had some value. But that does not make cost a value concept, although we might agree with Solomons that it is 'closely related' (S., p. 117).

Using the notion of RC as an upper limit, Parker and Harcourt continue the argument by considering the values which may be attributed to an asset. There is some confusion surrounding these values. For whereas four values are listed: 'RC and' net realizable value (NRV), the present value (PV) of the expected net receipts from the asset where this differs from RC and NRV, and the present value of the best alternative use of the funds locked up in the asset' (P & H, p. 17), only three symbols are used. This ellipsis occurs because NRV is subsequently defined to represent not only net realizable value (price?), but 'the larger of net realizable value and (in a capital-rationing situation) the present value of the best alternative investment' (P & H, p. 17). No explanation is given for using one symbol to represent two such diverse concepts, and whilst we therefore have serious doubts about the propriety of the notation used, we must concede that the argument which follows would not be altered by using separate symbols for each of the four values listed above. The six relationships now possible between RC, NRV

and PV are set out thus (P & H, p. 17):

- | | | | |
|---|---------------|---|---------------|
| 1 | NRV > PV > RC | 4 | PV > NRV > RC |
| 2 | NRV > RC > PV | 5 | RC > PV > NRV |
| 3 | PV > RC > NRV | 6 | RC > NRV > PV |

Then the cases are divided into two groups 'according to whether the asset should be held for use or resale':

- | | Use | | Resale |
|---|---------------|---|---------------|
| 3 | PV > RC > NRV | 1 | NRV > PV > RC |
| 4 | PV > NRV > RC | 2 | NRV > RC > PV |
| 5 | RC > PV > NRV | 6 | RC > NRV > PV |

This latter grouping is on the basis that where PV is greater than NRV the asset will be retained, and where PV is less than NRV the asset will be sold. The grouping is similar to that provided by Solomons, and subject to the comments above, we have no quarrel with the analysis so far. The hold-or-sell decision is precisely the kind of decision for which we would expect the accounting system to provide part, at least, of the relevant data. It is a decision which requires both the objective (that is – verifiable, factual) data of current market prices⁷ and an expectation of the likely proceeds from the alternative uses of the asset or the funds released by its sale. It is, moreover, a *planning* decision which is consistent with one of the purposes assumed by Parker and Harcourt to justify the calculation of income.

It is the next step which we find surprising. We are asked to 'delete all NRVs from the "use" group as irrelevant and all PVs from the resale group as irrelevant . . .'. Remembering that the purpose of this analysis is to determine which values are to be used when calculating *ex post* income and preparing stewardship reports, we would have expected the argument to proceed on the basis that the values chosen will be those most useful for decision making (i.e. in forecasting the future and planning accordingly) and evaluation (i.e. in controlling staff and evaluating stewards). But to eliminate two of the values which relate directly to these purposes, before the decisions required to achieve those purposes are made, seems to miss the point entirely. The effect of the elimination is to remove from further consideration everything but RC, with only two minor exceptions. The consequence of the elimination is,

⁷For a full discussion of the objectivity of current market prices, see Raymond J. Chambers, *Accounting, Evaluation and Economic Behaviour* (Englewood Cliffs, Prentice-Hall, 1966), pp. 68 and 91; and Robert R. Sterling, *Theory of the Measurement of Enterprise Income* (Lawrence, University Press of Kansas, 1970), p. 312. Parker and Harcourt appear to accept this view (P & H, p. 16) and there is therefore no disagreement between us on this point.

⁶A detailed analysis of the relevant section in Bonbright is contained in R. J. Chambers, 'Value to the Owner', *Abacus*, Vol. 7, June 1971, pp. 63–70.

as Prest points out,⁸ that the accountant thereby pre-empt the planning decision. For the use of RC implies that the firm wishes to maintain intact its physical assets (or the capacity to acquire the services currently provided by those assets). But, Prest argues, that may not be 'the' correct *motif* of action for the individual firm'. That is, the reports to both managers and investors should not be prepared on the assumption that firms will necessarily want to maintain their physical assets. On the contrary, the reports should help the decision-maker to determine whether that is the wisest course of action.

Similar arguments may be used in respect of the other purposes enumerated by Parker and Harcourt.

- (i) For forecasting the future, RC has only limited usefulness as it embodies a specific course of action. Alternatives are precluded by the assumption that whatever means become available to the firm will be used in replacing assets already held. A more useful value would be one that provides an indication of the means available, for the means currently available plus those expected in the future⁹, determine the course of action which it is feasible for a firm or individual to follow, and in respect of which it is therefore worthwhile forecasting the future. One of those courses of action may be to sell or consume and then replace certain assets. But to decide on that course of action before comparing the expected outcome with the outcomes expected from other, alternative, courses of action is to act irrationally (or in the case of stewards, irresponsibly).
- (ii) Planning and control. The detailed planning of activities and control of staff necessarily post-date decisions as to the general course of business. And it is in this context that decisions affecting specific assets are likely to be taken. For in formulating plans of operations and specifying tasks for personnel the feasibility of achieving objectives will have to be determined, and questions of the suitability of items of plant, and the desirability of replacing trading goods will arise. Again, the replacement of assets is only one of the alternative courses of action available to the firm, and the number and variety of alternatives will be determined by the stock of means available as

indicated by the net realizable prices of the assets which are held plus the accumulated cash and potential borrowings which may be used for the purpose. It seems pointless to presume a course of action without first ascertaining its feasibility and desirability.

- (iii) A report of stewardship. The purpose of a report of stewardship is, we assume, to enable the owner of the property entrusted to the steward to assess the performance of the steward and check on the condition of his property. That being so, it would seem that a stewardship report should contain information as to what has happened, and what is the current state of the property. What has happened in the past cannot be seen by referring to what the steward intends to do in the future. Nor can the current state of the property be assessed by referring to what it would cost to replace. A stewardship report would, we suggest, be more informative if it described the monetary effects of the events that actually occurred, and (in the belief that the property originally delivered to the steward represented a stock of purchasing power), a statement as to the stock of current purchasing power now in the possession of the steward.

In summary, what we are suggesting is that a statement purporting to contain a measure of *ex post* income should relate to the actions that were taken and the state of the property in possession as at the stipulated date, not to actions which someone expects to take, or the state of some property other than that in possession at that date.

Parker and Harcourt's argument, in contradiction to their assumed purposes, appears to follow the latter course. They see income as an indication of whether we are better off now by virtue of actions we *expect* to take in the future. This has some of the connotations of the concept which Parker and Harcourt say is used by economists, who 'have tended to define income in terms of expectations' (P & H, p. 4) because, as Hicks says, of its 'significance for conduct' (P & H, p. 81), and some of the connotations of the concept used by accountants who make 'a plea for objectivity' (P & H, p. 16). The result is a concept with no discernible parentage or purpose. But as we have suggested above, income measurement without purpose is pointless. So to 'value' an asset at RC in order to calculate income also seems pointless.

The hold or sell decision

Our argument may be made more explicit if we reconsider the hold or sell decision. If we look again

⁸A. R. Prest, 'Replacement Cost Depreciation' in Parker & Harcourt, pp. 290-309. Referred to in the introduction, pp. 19-20.

⁹We refer here to the firm's *fortune* and its *resources* as defined by G.L.S. Shackle, *Expectation, Enterprise and Profit* (London, George Allen & Unwin, 1970), p. 28.

at the 'Use' group of relationships on page 4, we can see that the adoption of the premise 'that the upper limit of value to the firm is current replacement cost' (P & H, p. 17), leads to the elimination of PV from two of the 'use' cases *as well as* from the 'resale' cases as already outlined. If we reinstate the PVs in the 'use' cases, remembering that this is relevant data for the decision-maker, and that we would, normally, use the existing assets in those cases *because* the net present value expected from their use exceeds the net present value of the best alternative use of the funds available from selling the assets, we have:

- 3 $PV > RC$
- 4 $PV > RC$
- 5 $RC > PV$

Now if the present value of using the asset exceeds the replacement cost of the asset, how can RC possibly be an upper limit to the 'value' of the asset to the firm? In two out of the three cases above, it just is not so.

If we go further, and reinstate the NRVs in the resale group we have:

- 1 $NRV > RC$
- 2 $NRV > RC$
- 6 $RC > NRV$

Again, we have in two out of three cases a 'value' (NRV) which sets an upper limit because it exceeds RC.

Further, let us consider the two cases in which RC is the greater of both PV and NRV – cases 5 and 6. In respect of case 5 it is said that PV is the relevant value because 'it would not be worth buying the asset were it not already held' (P & H, p. 18). This argument confuses what are quite separate decisions concerning the firm's *existing* asset and some possible *future* asset. The initial decision is whether to hold or sell an existing asset and as has already been shown because $PV > NRV$ the firm will presumably hold. The second decision is necessarily subsequent to the first because it is argued that if the firm were to consider replacement, (which however it will not because it has already decided to hold), then it will not replace because $RC > PV$. Surely then we can say that whenever $PV > NRV$ any consideration of RC is irrelevant. The decision to hold the firm's existing asset obviously excludes the possibility of replacement.

In case 6 NRV is chosen as the relevant value because the 'asset which the firm intends to sell is not worth replacing'. Again, that argument confuses the separate decisions concerning the firm's existing asset and its possible future asset. Again, the initial decision is whether to hold or sell the existing asset

and because $NRV > PV$ the firm will presumably sell. If, however, the firm decided to hold the asset, contrary to what would be a rational decision to sell, then the difference between NRV and PV would indicate the cost of the emotional attachment or non-monetary considerations which led the managers of the firm to retain the asset. Whatever the firm actually does, it is clear that *only* NRV and PV are relevant to the hold or sell decision. And if the firm makes a rational decision to sell the existing asset because $NRV > PV$ then RC is also precluded because NRV, which is the net present value of the best alternative use of the funds, exceeds the net present value of the use of the existing asset, whether that asset is retained, or a replacement is acquired and used in its place.

This brings us to the familiar situation where, under capital rationing, the investment proposal for which we have sufficient means and which offers the greatest margin between the present value of the estimated net cash receipts (PV) and the cost of the investment, that is, the *net* present value, will presumably be the one adopted. If, for example, we compare the net present value of a replacement investment ($PV_R - RC$) and the net present value of the best alternative investment ($PV_A - AC$) we have the following possibilities. Where $(PV_A - AC) > (PV_R - RC)$ the alternative investment will be preferred, but if $(PV_R - RC) > (PV_A - AC)$ then the replacement asset will be chosen. If, however, both $RC > PV_R$ and $AC > PV_A$ then the firm will probably place its surplus funds on, say, a term deposit until a more attractive investment opportunity arises. The point that we wish to emphasise is that RC is of relevance *only* to decisions concerning the acquisition of possible future assets. With only one unlikely exception,¹⁰ RC has no relevance to decisions concerning the *existing* assets held by the firm because the decision to hold or sell will be determined primarily by the relationship between the present value of the existing asset and the use which can be made of the funds released by its sale.

Conclusion

RC is then irrelevant to any *ex post* measure of a firm's *present* financial position in respect of the assets it actually currently possesses. If income is a

¹⁰The exception is case 4, where $PV > NRV > RC$. If in this case the net cash proceeds of selling the existing asset exceed RC, then it will pay the firm to sell its asset and buy a replacement immediately. This procedure can be repeated until the prices become realigned. The exception is labelled 'unlikely' because the situation described is caused by a market distortion. This case would not include retail inventories for which the net realizable amount will equal PV. That is, it is no different from any other kind of asset except that to 'use' the asset means to sell it.

measure of the change in a firm's position between two points of time (that is, an increase in its wealth) then RC is also irrelevant to that measure.

In the light of our argument let us now look again at the possible relationships between RC, PV and NRV which were noted by Parker and Harcourt. It will be remembered that they divided the six cases into two groups according to whether the assets of the firm should be held or sold. It is further suggested (P & H, p. 17) that this will conform, approximately, with the conventional division of the firm's assets into fixed and current groupings. But the decision to hold or sell an asset does not depend on an *arbitrary* grouping or *vice versa*. Only on the basis of the relationship, from time to time, between NRV and PV can that decision be made. This will naturally be in a continual state of flux because of changes in personal expectations and attitudes to risk, and changes in the general price level and in specific market prices through the influences of supply and demand which in turn result from changes in technology, consumer preferences and other factors.

It can also be seen that the decision to hold or sell is necessarily antecedent to any consideration of whether or not to replace the asset, and of the form that the replacement should take. If accounting is to provide a necessary part of the information for decision-making by managers or investors, if income

is to have any meaning in relation to the markets in which the firm buys and sells, and if magnitudes in accounting statements are to be objective (verifiable, factual), then NRV (defined now as net realizable price in the ordinary course of business)¹¹ is the relevant 'value', for it is the only one that satisfies all those conditions.

It is, moreover, a 'value' which may be obtained in practice without too much difficulty. Parker and Harcourt's view is that 'Both raw materials and finished goods will usually have reasonably easily ascertainable . . . net realizable values' (P & H, p. 18). For durable assets such as machinery, vehicles, buildings and land, some difficulties may be experienced. But there are in fact markets for used machinery and used vehicles which can be referred to. Buildings and land are actively traded, or if unique could be made the subject of an official valuation which may approximate NRV. But whatever the difficulties in practical application, the proposal to use NRVs is worth pursuing because it is the only 'value' relevant to all of the presumed purposes of *ex post* income calculation.

¹¹The net present value of the next best alternative which was included by Parker & Harcourt in their NRV is excluded here because, like the PV of the existing asset, it is a personal anticipation and is, therefore, entirely subjective.

Price and Discount Rationalisation in a Multiproduct company

K. Howard and M. G. Christopher

This paper examines the approach adopted and the conclusions reached in an investigation which was undertaken in a company marketing office stationery and associated equipment. It was felt within the company that current pricing policy was too arbitrary and that the effectiveness of the quantity discount system employed was reduced by its complexity. The recommendations arising from the analysis were accepted by the company and it is suggested that these have general applicability in the multiproduct situation.

The Environment of Pricing Decisions

In the multi-product company a number of issues arise in the pricing of individual products that do not occur when a company markets only a few products. Specifically, there are two problem areas, the possibilities of the existence of cross-elasticities between products and secondly, the existence of joint costs. Cross-elasticity refers to the existence of interlinkages in price/quantity relationships between different products. When cross-elasticity is positive an increase (decrease) in price for one product leads to an increase (decrease) in demand for another product. Thus positive cross-elasticity would suggest that the products were substitutes whereas a negative cross-elasticity implying an inverse correlation would suggest that the products were complements. Zero cross-elasticity implies that there is no such inter-linked price/demand relationship.

Thus the multi-product company in making decisions must take into account the prices of other products which it manufactures. Further, the existence in the typical multi-product company of joint costs can be a major factor in forming decisions. However, the nature of the impact of joint costs will largely be determined by the approach to costing used within the company. If the company adopts a 'full cost' method of costing whereby all joint overheads are allocated to products on some nominal basis,

the effect of decreasing the price of one product can have the effect of increasing the unit cost of a substitute product as its sales will fall and yet it will still be carrying its full allocation of overheads. If, in addition, the company adjusts prices on the basis of a simple mark-up, then the price of this substitute product will have to be increased and an interactive process of uncertain outcome will be set in train.

These comments are made simply to give some appreciation of the complex context of pricing in a multi-product firm using conventional costing and pricing procedures. The thesis of this paper is that the pricing policy of a company should be determined by the market situation, tempered by cost considerations. This is particularly the case when discount structures for quantity purchases by customers are being considered; the way in which products are grouped for discount purposes, for example, should make some allowance for possible cross-elasticities. Similarly, only the direct costs of each product and those fixed costs that are truly separable should be considered when setting the minimum price limit – the maximum price limit will be purely a matter for marketing decision.

The Role of the Price Discount

It is common practice for companies to offer discounts from a standard price when quantities of a certain amount are ordered. Usually a price discount schedule will exist which specifies the minimum quantity at which a discount becomes available, and also the additional quantities that must be ordered to gain more advantageous discounts.

The rationale of the price discount for quantity purchases is simple. In the first instance the competitive environment may demand that discounts over and above the normal trade mark-up are available on larger orders. This simple factor can often be an overriding consideration in the determination of a specific discount schedule. In addition, however, there will

hopefully be a number of economic advantages associated with the presence of a discount structure. The first of these is that the customer may be encouraged to buy more of a single item and/or to order a wider range of the manufacturer's output depending on the nature of the price discount schedule. Secondly, by ordering in larger quantities, the customer will carry a greater proportion of the total costs of holding inventory: costs that would otherwise have to be borne by the manufacturer. Thirdly, the encouragement to purchase in larger quantities could well lead to a decline in the number of orders placed by a customer in a given period; this will have the effect of reducing the manufacturer's costs of meeting orders.

The achievement of these effects is dependent upon a number of assumptions. Firstly, the customer will only buy more of a product if he thinks he can sell more, although a good discount will encourage him to give the product greater display, shelf space and so on. Secondly, and perhaps more importantly, the most effective working of a discount system requires that the customer, in the absence of price breaks due to discounts, will tend to order in quantities that will minimize his total inventory costs, i.e. he will balance inventory holding costs against the costs of ordering and the costs of stock-outs. Thus to this rational stockist a quantity discount, to be effective, should be at least large enough to compensate the buyer for carrying a larger average inventory from a quantity purchase.¹ If, however, as is quite possible, the customer is not ordering on such strictly 'scientific' lines then the likelihood is that his reaction to a quantity discount will be far more haphazard.

The essential purpose of offering a quantity discount schedule to customers is that a number of fixed and semi-variable marketing and distribution costs can be spread over a larger number of units if the size of the order is increased. Thus the unit cost of meeting an order can be decreased. Examples of such costs are: advertising, order processing, distribution and the cost of the sales organisation. These costs will not usually vary with the size of an order, thus a large order will cost more or less the same to meet as a small order. The problem is that the contribution from a small order may not be sufficient to cover the unit cost of meeting an order – in which case that particular business will be transacted at a loss. If all these fixed and semi-variable costs were to be covered no matter what the size of the order, then this would normally mean the setting of a much higher base price. Frequently, there are a number of very good reasons why this is not feasible, hence the need for an alternative solution. One such solution is the use of an

effective discount schedule, perhaps combined with a minimum order quantity.

However, in the desire to encourage larger orders through a system of discounts, care must be taken to ensure that total profitability is not reduced. The problem thus reduces to one of balancing the costs of meeting an order against the possibility of a fall in total profit contribution. On the other hand, if total sales increase more than proportionately as a result of a price discount, then the total profit contribution can be enhanced.

The comments made in these two sections provide the background to analysis to be developed in this paper which is designed to provide a basis for the establishment of a rational price and discount structure within a multi-product company.

Information Availability and First Stage Analysis

The investigation was facilitated by available history of receipts, direct and variable overhead costs, and hence 'contribution' pertaining to each item (stock-keeping unit). Contribution (towards unallocated overheads) is defined as the difference between net receipts from sales of an item on the one hand and direct costs and variable overheads incurred in the production and selling of the item on the other. Monthly summaries also indicated for each item the percentage of both total sales and contribution accounted for by that item.

At an early stage it was recognised that the distribution of ranked sales was highly skewed and that detailed consideration given to relatively few items would probably achieve the improvement in performance required.

Thus the basis of an average taken over four typical months it was found that by adopting an arbitrary cut-off at 0.1% of total sales 88 items were included. These items, being less than 5% of the total stock items, accounted for approximately 70% of total stock sales. The proportion of total contribution arising from these items was only slightly higher, being 71% and hence taken together the 88 items were of average profitability.

For each item a 'profitability ratio' r was computed where:

$$r_i = \frac{\text{Percentage of contribution from all items accounted for by item } i}{\text{Percentage of sales of all items accounted for by item } i}$$

Thus, those items for which r exceeds unity may be viewed as being above average profitability, the converse applying for r less than unity. Each item may be ranked according to % of total sales, % of total con-

¹Crowther, J.F., (1964) 'Rationale of Quantity Discounts' the *Harvard Business Review* p. 42 March/April 1964.

tribution, and profitability ratio and these rankings for the ten products with the highest share of sales are shown in Table 1 together with the actual profitability ratio.

It is evident from Table 1 that those products which rank highly in respect of sales and contribution do not rank highly in respect of profitability. It will be noted that in four cases, D, E, I and J, the products are of less than average profitability.

The profitability ratio provides a basis for action by management. When each item's ratio is viewed in relation to others in total or in a group it becomes possible to identify those items which, for whatever reason, are performing better or worse than others. Price (and possibly cost) rationalisation based on the assessment of profitability in respect of those items which generate the major part of sales and contribution affords the opportunity for a substantial improvement in total profitability. It was accepted by management that the time spent by them in assessing the performance of each of the 88 items which produced 99.9% of both sales and contribution was justified.

In Appendix 1 the profitability ratios for the 88 items are broken down into the six product groups used by the companies. Certain conclusions may be drawn in general terms about the groupings. Thus, it is evident that the profitability of items in Groups A, B, C, and F are fairly evenly spread about the range average. Group A, however, possesses much greater dispersion than Groups B, C, and F. The ratios for groups D (with one exception) and E on the other hand indicate that above average profitability was being achieved. The results are of interest on several counts.

In the first place it appears that market considerations have led, in the cases of groups D and E, to a situation in which the products concerned have been able to achieve a higher than average profitability.

Secondly, although management had not consciously attempted to achieve a consistent level of performance in each product group, this would in fact seem to have been realised for items in all groups except A (with individual exceptions perhaps in groups B and D).

Thirdly, a number of products within the same group which are well below the average profitability of the group are noticeable. Reference was made to one such anomaly of this nature in group D and others may be recognised in groups A, B, and C. Management was able to suggest reasons for this. In one instance this was accepted as being due to a high and unavoidable cost of production. In another case the decision was made to increase the price of the product immediately to achieve a more satisfactory margin.

Finally, items with above average profitability were highlighted and this permitted management to assess whether any conclusions could be related to other products in the group. Such conclusions could be that a more efficient production process is available or that the market may accept a higher price. Alternatively, it could be that an opportunity is seen to increase the total contribution from an item by an increase in sales arising from a price reduction or through the mechanism of a discount structure. A factor of some importance here is the price elasticity of demand for the product; the way in which demand reacts to changes in price obviously affects the efficacy of any discount policy.

A Basis for Price and Discount Rationalisation

The conclusions described so far have been of a general nature. In some cases an upward movement in price is indicated and, although in other cases a price reduction may achieve an increase in profitability, the company's preference was to realise this through

TABLE 1
The ranking of the ten products with highest sales by % of total sales,
% of contribution and profitability ratio

| Product | Rank according to: | | | Actual Profitability |
|---------|--------------------|-------------------------|---------------|----------------------|
| | % of Total Sales | % of Total Contribution | Profitability | |
| A | 1 | 1 | 32 | 1.09 |
| B | 2 | 2 | 44 | 1.02 |
| C | 3 | 3 | 21 | 1.17 |
| D | 4 | 5 | 84 | 0.64 |
| E | 5 | 4 | 64 | 0.92 |
| F | 6 | 6 | 28 | 1.13 |
| G | 7 | 7 | 40 | 1.03 |
| H | 8 | 8 | 50 | 1.01 |
| I | 9 | 16 | 79 | .79 |
| J | 10 | 34 | 87 | .51 |

quantity discounts rather than a general price reduction. The aim of the analysis was to determine appropriate changes in the price of products by making use of managerial estimates of the price-quantity relationship. In order to incorporate these estimates the concept of elasticity was introduced; not, however, in the rigorous sense of economic theory but rather in a form more operationally viable. It was proposed that for any item, i , under consideration, management should estimate the likely change in quantity caused by a change in price, in which case elasticity, e_i , is given by:

$$e_i = \frac{\% \text{ change in quantity}}{\% \text{ change in price}} \quad (1)$$

It was appreciated that this approach to elasticity assumed the demand curve for the product to be linear about the existing levels of price and quantity. Excluding the possibility of 'luxury goods', for an elastic product an increase (decrease) in price will cause a decrease (increase) in quantity sold. By taking the changes in these directions the value of e will be non-negative.

The profitability ratio, r , referred to in the last section may be expressed as:

$$r_i = \frac{c_i \cdot \sum s_i}{\sum c_i s_i} = \frac{c_i \cdot A}{s_i} \quad (2)$$

with the summation being taken over all items manufactured by the company and where c_i is the total contribution from sales, s_i of a product i during a given period. In a multi-product situation the ratio A of total sales to total contribution changes only slowly over time in response to changes in c_i and s_i . In fact in the company concerned A had remained unchanged to two decimal places for a number of months.

On the assumption that e_i and r_i may be quantified from expressions (1) and (2) it is possible to develop a basis for price and discount rationalisation. The analysis is similar in each case but the method of presentation and interpretation differs. It was felt that management would need to be able to determine the specific percentage price increase necessary to achieve a certain level of profitability whereas computation of the maximum (break-even) discount would give scope for management to consider alternative discount policies together with other aspects of a marketing or administrative nature excluded from the quantitative analysis.

Rationalisation of Price and Profitability

Although products which, in terms of profitability, fall at either end of the group distributions in Appen-

dix I may be said to be priced at a level which in terms of price are atypical and hence perhaps rational it would hardly be expected that management would agree to a reduction in price of the highly profitable products. This section assumes, therefore, that upward price movement will be involved with the aim of achieving a higher level of profitability.

The basis of the analysis which follows is that the determination of e_i for each product must be a managerial decision. The estimates of e_i summarise the attitude of management towards the complexities of price-demand relationships, price elasticities, substitution elasticities and so on. In arriving at the estimates it is natural that account should be taken of expert knowledge within the organisation but ultimately, the decision is made by management, upon whom the consequences will impinge directly, using their judgment based on experience.

Assume that management wished to determine the percentage increase in sales price of item i , K_i , which is required to achieve a new profitability ratio, R_i , then on the assumption that A the ratio of total sales to total contribution is insensitive,

$$R_i = \frac{c_i^1}{s_i^1} \cdot A \quad (3)$$

where c_i^1 and s_i^1 are the new contribution and sales for product i . Now c_i the present contribution may from (2) be expressed:

$$c_i = \frac{r_i s_i}{A} = \frac{r_i p_i q_i}{A} = p_i q_i - d_i q_i \quad (4)$$

where p_i is the price per unit of product i , net of discount (trade or quantity) and tax, q_i is the number of units of product i sold and d_i is the direct cost per unit. The latter may then be written:

$$d_i = p_i \left(1 - \frac{r_i}{A} \right) \quad (5)$$

Note that r_i cannot exceed A as contribution would then exceed sales.

The new contribution c_i^1 will be determined by the new quantity (reduced), the new price (increased) and the direct production cost (unchanged) and is:

$$c_i^1 = \frac{(q_i - e_i q_i K_i)}{100} \left(\frac{p_i + p_i K_i}{100} \right) - \frac{(q_i - e_i q_i K_i)}{100} d_i \quad (6)$$

From (3), (5), and (6) K_i is obtained as:

$$K_i = 100 \frac{(R_i - r_i)}{(A - r_i)} \quad (7)$$

At first sight the expression for K_i may appear surprising in that it is independent of elasticity. It

will, however, be apparent that total contribution from an item may be reduced by an increase in price. A necessary condition for the use of this approach is, therefore, that:

$$c_i^1 \geq c_i \quad (8)$$

which, from (4), (5), and (6), enables a constrained value of K_i in terms of e_i and r_i to be determined as:

$$K_i < 100 \frac{(1 - r_i)}{e_i A} \quad (9)$$

This condition is restrictive only for high values of r_i or e_i .

Rationalisation of Discount Policy

Although discounts may be viewed as part of the general promotional strategy involving aspects which are difficult to quantify they must ultimately be viewed in economic terms. Thus, as in (8) a necessary condition for discount policy is that total contribution should not be decreased. It is, however, accepted that a discount policy may be required in which a number of price breaks are involved. It was, therefore, decided that management should be able to determine the break-even percentage discount B_i at which point indifference would exist between maintaining the current price and applying the discount. Management could then work within the break-even value setting discount breaks according to market considerations.

In this case price reductions and quantity increases are involved and using relationships of the form of (4), (5), (6), and (8) the break-even discount percentage, B_i , for product i is:

$$B_i = 100 \left[\frac{r_i - 1}{A e_i} \right] \quad (10)$$

A discount in excess of B_i determined according to r_i and e_i is not justified on economic grounds.

Implementation of the Price and Discount Policies

The proposals were accepted by management as a suitable basis for the development of a restructured price list. For the company in question the ratio of total sales to total contribution was 1.7 which was thus used to replace A in (7), (9), and (10). This enabled the quantified attitude of management towards elasticity to be incorporated in the decision process when a change in price or discount was under consideration. It was appreciated that only simple calculations were involved in using (7) and (9) or (10) (or alternatively, monograms could be constructed) but it was felt that management would gain a greater appreciation of the implications if the relationships were represented graphically as in

Appendices 2 and 3. Advantage was taken of the linear relationships requiring interpolation of the current profitability ratio r_i in Appendix 2 and elasticity e_i in Appendix 3.

Appendix 2 indicates how only limited increases in profitability may be achieved by 'reasonable' (say 10%) increases in price. Also as current profitability increases it is evident that higher percentage price increases are necessary to achieve a certain percentage increase in the profitability ratio.

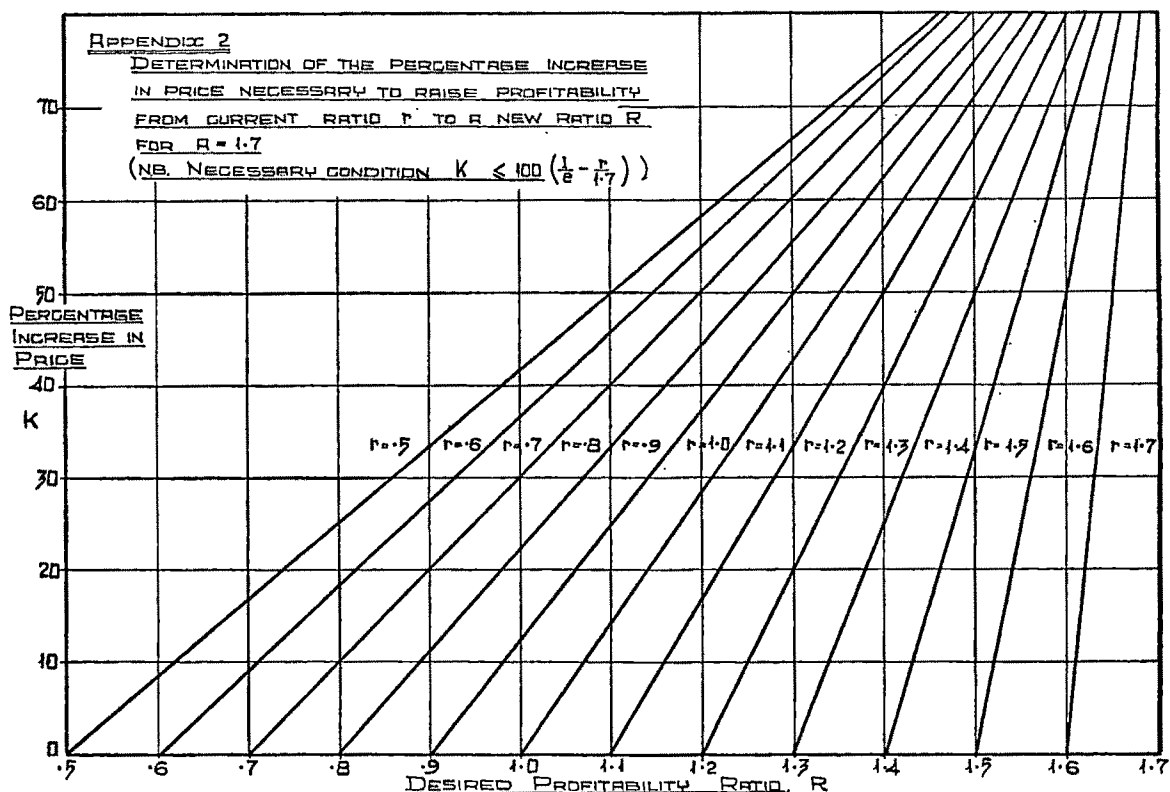
Appendix 3 is dual purpose. The ordinate is scaled positively on each side of the abscissa so that both the constraint on price increase (9), and the break-even discount (10), may be determined. Considering first the constraint on price increase this will, in general, involve items with a profitability ratio of less than 1. It will be apparent that the constraint only becomes restrictive as products tend towards high price elasticity. On the other hand discounts are only feasible for products which are more than unitary elastic, and for products which are not profitable a very high elasticity is required before a discount may be contemplated.

An example of a Price Increase Planned to Increase Profitability

Consider a product for which monthly net sales are £10,000 at a selling price of £10 per unit. The profitability ratio r_i is 0.5 and it is desired to raise this to 0.8. (It is assumed in this case that profitability can only be improved through revenue and that there is no scope for cost reduction.) The management estimate of elasticity e_i is unity. By calculation from (7) and (9) or Appendices 2 and 3 the price increase constraint is approximately 70% and this is in excess of the necessary price increase of 25%. If this increase is acceptable then it may be shown from (4) that the new contribution from the £10,000 sales will be about £4,700 compared with an original contribution of about £2,900. If, however, management feel that a percentage increase of the order indicated is unacceptable they may prefer to indicate a maximum increase and determine the effect on profitability. Assume that a price increase of 15% is seen as being realistic; this would indicate that a new profitability ratio of 0.68 would be achieved, in which case the monthly contribution would rise to £4,000.

An example of the establishment and assessment of a quantity discount

Consider a product for which the profitability ratio is 1.4 is sold in boxes of 50. Elasticity is estimated to be 1.5 suggesting a break-even discount of 16%. The discount to date arising from the various trade discounts given has averaged 40%. The maximum discount which may, therefore, be added directly to the

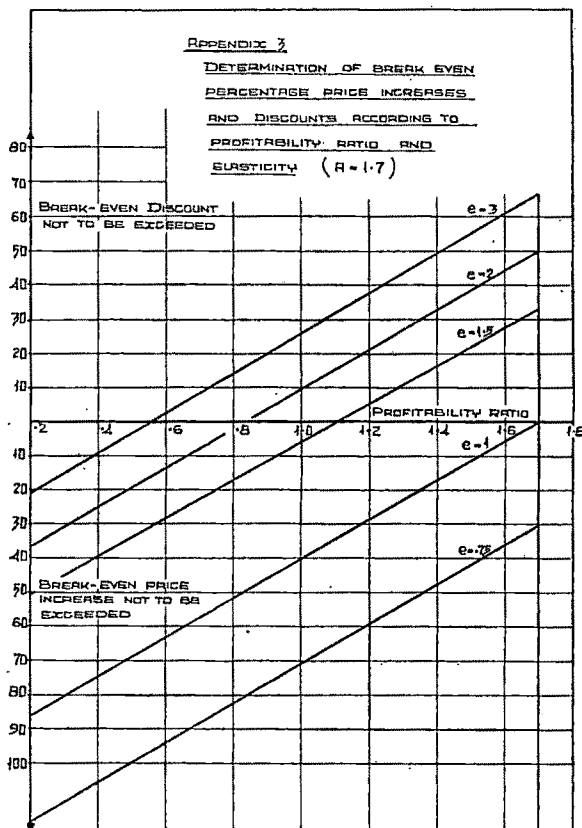


may appear to be the estimation of the price elasticities of demand as defined. It is, however, suggested that the responsibility for making such estimates either implicitly or explicitly must rest with management. In a sense the procedure is self-regulating in that certain levels of management will be concerned with the pricing of particular groups of products according to their importance in terms of contribution. It is highly likely that senior management will wish to be directly involved in pricing decisions relating to, say, those 100 products which generate 80% of sales.

The analysis aims mainly to improve profitability and it is important to appreciate that once the procedure has been implemented and initial rationalisation achieved, the continuing process is one of control. Each financial period, management is given the information provided in Table 1 for the arbitrarily defined 'significant' products. Reviews are then undertaken of products which are anomalous in terms of profitability. These reviews may lead to a change in a particular price or discount or to the production or marketing policy involved. At longer intervals a review will be undertaken of all products for which this level of control is thought desirable.

Whilst the procedures described in this paper were designed for a specific company situation it is envisaged that their applicability is valid in other multi-product companies. The issues identified at the outset of this exposition suggest the need for a more careful and sophisticated approach to product-line pricing

and whilst the operational problems of implementing rational price and discount policies are great, considerable impacts on company profitability may be achieved through the use of the methods described.



Accounting for Goodwill

An empirical study of company practices in the United Kingdom—1962 to 1971

T. A. Lee

Introduction

Lack of empirical research

This paper is concerned primarily with fact-finding in the area of accounting for goodwill. Of secondary concern is the subsequent interpretation of the collected facts, and the proposal of a number of suggestions for improving the standards of accounting applicable to these areas at the present time.

A lot has been written recently on the subject of accounting for goodwill, presumably because of its increasing importance due to the so-called merger boom of the 1960s. However, despite this evidently widespread interest, little work has been undertaken to find out exactly what is going on in practice – that is, apart from the necessarily limited research of professional accountancy bodies when surveying published financial statements as a whole.¹ Thus, in the main, the emphasis of accountancy writings has been on arguing cases for particular accounting treatments for goodwill rather than on investigating what is going on in the 'market place'. For example, some very recent publications have presented suggestions for standardising the relevant accounting practices but without much reference to the situations which the writers assume to require standardisation; Eiteman advocating that goodwill should not be amortised unless there is firm evidence for doing so;² the Accounting Standards Steering Committee recommending mandatory 'pooling of interests'

accounting in defined circumstances (thus, in these instances, avoiding the problem of goodwill);³ McLean suggesting pooling accounting along the same lines as the ASSC, and the immediate writing off of goodwill to shareholders' equity;⁴ and Percy concluding that 'goodwill should be written off by appropriations of profit over periods determined at the time it arises, but not exceeding, say, 40 years'.⁵ The writer has also tended to ignore the present state of practice when suggesting that the problems associated with goodwill are too complex to be coped with by traditional accrual accounting.⁶

Aim of the paper

The aim of this paper, therefore, is to report and comment on a *preliminary* study of the accounting practices adopted by certain United Kingdom companies when reporting goodwill to their shareholders by means of the annual financial report. It is not intended to be a definitive, all-embracing investigation – indeed, due to certain gaps in the data mentioned later, it cannot possibly be. However, it is hoped that, despite such limitations, it will provide sufficient analysed facts and related comments to be of immediate interest to accountants and others interested in the subjects concerned, as well as to encourage other researchers to pursue further studies to establish the current 'state of the art'. Unless this is done, the writer firmly believes that the case for greater uniformity of accounting practices related to goodwill cannot be conclusively made – in other

¹Survey of Published Accounts 1970-71, The General Educational Trust of The Institute of Chartered Accountants in England and Wales, 1972; and *Accounting Trends and Techniques*, American Institute of Certified Public Accountants, 1971. Arthur Wyatt in 'A Critical Study of Accounting for Business Combinations' *Accounting Research Study No. 5*, AICPA, 1965 also produced a similar brief survey of such accounting practices.

²Dean S. Eiteman, 'Critical Problems in Accounting for Goodwill', *Journal of Accountancy*, March 1971, p.48.

³'Accounting for Acquisitions and Mergers', *The Accountant's Magazine*, February 1971, p.62.

⁴A. T. McLean, *Accounting for Business Combinations and Goodwill*, The Institute of Chartered Accountants of Scotland, 1972, pp.84-85.

⁵Jeffery Percy, 'Goodwill – an Aide-Memoire', *The Accountant's Magazine*, July 1972, p.348.

⁶T. A. Lee, 'Goodwill – an Example of Will O' the Wisp Accounting', *Accounting and Business Research*, Autumn 1971, p.325.

words, the assumed situation of flexibility in practice must be proven before solutions of uniformity are imposed. Although the writer has firmly held doubts about the overall validity of the present accrual basis for financial accounting measurements and reports,⁷ he accepts fully the recent comment of McLean that 'whether Mr. Lee's thoughts stimulate debate or not, the present framework will certainly continue in existence for some considerable time and attention must be focused on making financial information better suited to investor requirements within the recognised rules of accrual and historical accounting'.⁸ It is hoped that this study will help towards the above desired end.

A survey of goodwill accounting practices

Survey of top 100 companies

It has been suggested in the previous paragraphs that enough has been written philosophising about what should be done in practice when accounting for goodwill. Consequently, insufficient attention has been paid in the past to investigating what actually goes on in practice. With this in mind, a first step was the institution of a detailed survey of ten years' annual financial reports of the top 100 UK industrial companies – that is, covering the years 1962 to 1971 inclusive. An analysis over the last decade appeared to be potentially useful in order to trace any significant developments in practices during a period when the business combination boom was at full momentum. It was felt also that this would help in understanding practices as they exist today.

The choice for analysis of the annual reports of the top 100 industrial companies requires some additional explanation, and the following points appear to be pertinent. (a) The survey was concerned essentially with goodwill; a factor which normally comes within the ambit of accounting when a business is acquired or merged. It therefore seemed logical to examine companies where business combinations tended to be numerous as well as individually significant in size. The largest UK industrial companies appeared to be the most appropriate subjects for investigation. (b) Because of their employment of leading accountants and auditors, it was thought probable that the larger companies would be using accounting practices which, on the whole, would probably be generally recognised as the most acceptable and, possibly, the most enlightened.

The analysis was limited to 100 companies because of the sheer amount of work involved. It should therefore be noted at the outset that the comments, remarks and conclusions made subsequently are in no way intended to be general and applicable to all UK corporate activity. They are particular findings and have been interpreted in that context. However, the reader's attention is drawn to item (b) above, should he or she wish to make a wider interpretation of them.

The survey response

The top 100 companies listed in the industrial section of *The Times* 1000: 1971-72 were used for the survey. The names of the companies, ranked on the basis of their capital employed, are given in Appendix 1. Individual letters were sent to the company registrars or secretaries concerned, and replies were received in time from all companies except Brooke Bond Liebig, Continental Oil Holdings, The Hawker Siddeley Group, London Merchant Securities, Standard Telephones and Cables, and Trust Houses Forte – a minimal 6% 'failure' rate. Of the 94 replies received, 6 companies stated they were subsidiaries not prepared to issue their annual reports. These were Gulf Oil (UK), IBM United Kingdom Holdings, Mobil Oil Co., Philips Electronic and Associated Industries, Shell Mex and BP, and Texaco. This left 88 companies to survey over the ten year period; a figure subject to slight amendment as mentioned in the following paragraph.

The secretaries of the companies circularised were asked to send, where possible, the annual reports of any companies which, during the ten year period, had merged to form the whole or a significant part of their existing companies. The following companies complied with this request – The Dickinson Robinson Group (formed by the combination of John Dickinson and ESA Robinson (Holdings) in 1966); General Electric (which acquired English Electric in 1968); English Calico (formed by the combination of English Sewing Cotton and the Calico Printers' Association in 1968); and Cadbury Schweppes (formed by the combination of Schweppes and the Cadbury Group in 1969). The annual reports of each of the above combining companies were analysed up to the year of merger, and the reports of the resultant combinations were analysed from the year of merger onwards. In addition, the reports of Cunard were analysed for the years 1962 to 1970 inclusive. In 1971, Cunard was acquired by Trafalgar House Investments and, therefore, has not been analysed for that year as the relevant report was not made available. The 1971 report of Trafalgar was analysed, however, and it

⁷See Lee, *op cit*, and 'A Case for Cash Flow Accounting', *Journal of Business Finance*, Summer 1972, pp.27-36.

⁸McLean, *op cit*, p.60.

included the relevant figures for Cunard for that year. The effect of these combinations and changes is shown in Table 1 which states, *inter alia*, the number of companies actually surveyed for goodwill practices in each year of the period from 1962 to 1971.

Of the companies surveyed, some gave the required reports for the complete period from 1962 to 1971 inclusive whilst others, due to lack of available copies, could only give reports for certain years. This meant the survey was to a certain extent incomplete. However, in order to minimise the effects of this, the following steps were taken. (a) When analysing each year separately, every report made available was analysed, and the resultant data were then converted into percentage form for comparative purposes. (b) When analysing changes attributable to individual companies over time, the examination was limited to those companies for which there was sufficient information to cover specified periods of time – these periods being 1962–71, 1967–71 and 1969–71. The exact information loss can be seen in the aforementioned Table 1. If this study had been intended as a definitive investigation then the writer would have been perturbed at this loss from the statistical validity point of view. However, as it is presented as no more than a progress report, it was felt that the data gaps were not serious enough to prevent the reporting of valuable and interesting facts which had been collected from the available annual reports.

Accounting for goodwill - its nature and problems

Before going on to the detailed survey analysis, it is worthwhile looking briefly at the accounting framework of the goodwill problem.

The nature of goodwill

Goodwill is a much used term in the literature of accounting and, for purposes of this paper, has been defined as the purchase price to an acquiring company of profits over and above the purchase price of the acquired net tangible assets necessary to produce these profits. In other words, it is the difference between the value of the acquired entity as a whole and the sum of the separate values attributed to the acquired tangible net assets. It can include, therefore, such intangible assets as patents, trademarks and copyrights. However, as these elements of goodwill are clearly specified as to nature and form, they have been excluded from the ambit of this survey, unless their reported values happened to be included in an omnibus valuation of goodwill in the balance sheet concerned. The incidence and valuations attributed to patents, etc. ignored in this way amongst the analysed companies were found to be negligible in comparison to the unspecified goodwill which was the main subject of this part of the study.

Goodwill normally arises when 'payment' is made for it as part of a business combination agreement, but its existence can be completely ignored by use of pooling accounting. The accounting treatment attributed to it can vary from company to company. It can be accounted for as an asset and remain unamortised; it can be treated as an asset and be amortised over a selected life; or it can be written off to profits or reserves in its entirety on acquisition. Alternatively, it may be disclosed as a separate deduction from reserves (amortised or unamortised) instead of as an asset; or it may even appear as a reserve, if the value of net tangible assets acquired exceeds the total acquisition price. Disclosure of goodwill is governed by the familiar Section 8(1)(b), Companies Act 1948 regarding the amount of goodwill, patents and trade marks so far not written off.

TABLE 1

The survey population; information on accounting for goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|------|------|------|------|------|------|------|------|------|------|
| Number of companies available for analysis | 92 | 92 | 92 | 92 | 91* | 91 | 90† | 88‡ | 88 | 87§ |
| Percentage companies lacking sufficient information for analysis | 39 | 40 | 40 | 35 | 30 | 22 | 18 | 10 | 10 | 3 |
| Percentage companies with sufficient information for analysis | 61 | 60 | 60 | 65 | 70 | 78 | 82 | 90 | 90 | 97 |

* John Dickinson and ESA Robinson Holdings merge to form the John Dickinson Group.

† English Electric taken over by General Electric.

‡ English Sewing Cotton and Calico Printers' Association merge to form English Calico; Schweppes and the Cadbury Group merge to form Cadbury Schweppes.

§ Cunard taken over by Trafalgar House Investments.

Goodwill has a generally accepted relationship with profitability – the higher business profits are, the more likely it is that goodwill exists in the business. However, it is its intangible nature which has caused so much concern in the past; accountants and businessmen no doubt feeling that there is something unreal about it. In fact, the term goodwill is a collective one, representing several tangible and intangible business resources contributing to overall profitability. It therefore exists in a business so long as these resources exist too, and often a great deal of expenditure is incurred by a business to maintain the value of such resources and thereby maintain goodwill's existence.

Purchased goodwill is the only type presently recognised for accounting purposes; goodwill created and maintained since the original purchase (that is, economic goodwill) being ignored, mainly because of the subjectiveness which would be involved in its recognition and subsequent valuation. Traditional goodwill is therefore no more than a historic purchase cost representing past expectations of investors. Its historic nature and its intangibility are normally given as the main reasons for its amortisation or immediate write off. However, to eliminate it in this way does tend to ignore its possible continuing existence, and several accountants have advocated that it should not be written off or amortised unless there are sound business and economic reasons evidencing a diminution in value.⁹ The arguments about its accounting treatment still rage, and only one further comment can safely be made at this point, and that is that no consensus has yet been reached and nor is one likely to be reached for some time. What can therefore be undertaken at the present time is a presentation of facts on how companies cope in practice with the problem of goodwill. The next part of this paper attempts to give the reader some answers to this point.

⁹See, in particular, Eiteman, *op cit*, and Reg. S. Gynther, 'Some "Conceptualising" on Goodwill', *The Accounting Review*, April 1969, pp.247-255.

Analysis of survey data

The following sections describe the data analysed from the annual reports of the companies able to supply them. The period covered was 1962 to 1971 inclusive. In certain instances it was possible to make use of comparative figures when annual reports were not made available.

1 The survey population

Table 1 states the number of company reports available for analysis in connection with goodwill in each of the ten years, the annual information loss never exceeding 40% of the survey companies. The steady increase of available annual reports throughout the period ensured a sufficient number of companies for analysis, particularly in the most recent years of 1967 to 1971.

Table 2 reveals the number of companies in each year which made some reference or other to goodwill in their annual reports. A surprisingly consistent percentage in each year (an overall incidence of 20% for the ten years) made no reference at all to goodwill, indicating that either (a) the companies concerned were not involved in acquisition or merger activity; (b) they had accounted for their acquisitions or mergers on a valuation basis which avoided the problem of goodwill; or (c) in certain instances, goodwill may not have existed in the companies acquired or merged. Taking the analysed companies who disclosed acquisitions or mergers, Appendix 2 reveals that, in each of the ten years, a very small percentage made no reference to goodwill (the rate varying between 3% and 9%), thus leading to a possible conclusion that the majority of companies making no disclosure of goodwill did so because they were not involved in acquisitions or mergers rather than because they used techniques of a pooling accounting nature.

2 Composition of goodwill

Using the companies disclosing goodwill in their

TABLE 2
Companies disclosing information on goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|------|------|------|------|------|------|------|------|------|------|
| Number of companies with sufficient information for analysis | 56 | 55 | 55 | 60 | 64 | 71 | 74 | 79 | 79 | 84 |
| Percentage companies with no disclosure of goodwill | 20 | 22 | 18 | 23 | 19 | 18 | 19 | 16 | 16 | 21 |
| Percentage companies with definite disclosure of goodwill | 80 | 78 | 82 | 77 | 81 | 82 | 81 | 84 | 84 | 79 |

annual reports, Appendix 3 analyses the composition of the disclosed figures. It is clearly seen from this tabulation that a majority of companies in each year accounted solely for consolidation goodwill, the overall rate for the period being 68%. Therefore, most of the goodwill accounted for was that arising solely from acquisitions or mergers. However, a substantial number of companies (the rate varying from 25% to 42%) accounted for acquisition and merger goodwill combined with patents trade marks, etc., and/or goodwill acquired through the purchase of unincorporated businesses or divisions of companies. These findings, not surprisingly, evidence the very strong relationship between accounting for business combinations and accounting for goodwill, and the importance of investigating further to ascertain the methods of accounting adopted in the treatment of goodwill. It is also not surprising that none of the companies accounted for anything other than purchased goodwill (as distinct from economic goodwill).¹⁰

3 Accounting treatment of goodwill

Appendix 4 outlines the various means by which the companies analysed treated disclosed goodwill in their financial statements. Five main ways were used – that is, goodwill was treated either (a) as a fixed asset; (b) as an asset classified neither as fixed nor current; (c) as a separate deduction from reserves; (d) as a non-distributable reserve (in other words, negative goodwill); or (e) as a write off or write back either to profits retained for the year or to reserves (usually capital reserves). As the tabulation outlines in detail, a number of companies in each year treated goodwill in two ways – for example, as an asset or deduction from reserves with an additional write off to reserves, or as a reserve with an additional write back to reserves. The percentage of companies concerned doing this ranged from 35% in 1962 to 21% in 1971 with an overall average rate for the period of 24%.

The main impressions to be gained from the figures in Appendix 4 are as follows. (a) A large and relatively consistent percentage of the companies concerned treated goodwill as an asset (the overall rate for the ten years being 48%). There was, however, a slight decline over the ten years in the use of the asset treatment (from 55% in 1962 to 46% in 1971), particularly in connection with the classification of goodwill as a fixed asset (the relevant rate falling from 31% in 1962 to 14% in 1971). Indeed, there

was a definite movement away from classifying goodwill as a fixed asset towards the unspecified 'other' asset classification. (b) A minority of companies opted for showing goodwill as a separate deduction from reserves instead of as an asset (the rate fluctuating from year to year between 9% and 22%). This effectively reduced the statement of capital employed in the companies concerned, and appeared to be used as a 'half-way house' between asset treatment and complete write off. The practice, however, tended to diminish over the ten year period until, in 1971, its occurrence was minimal at 9% of companies analysed. (c) In each year, a few companies accounted for negative goodwill as a reserve, from which can be deduced that the valuations placed on the relevant acquisitions and mergers were less than the book values attributable to the acquired net assets (the rate varied between 8% and 13% with an overall incidence for the period of 9%). This type of situation occurred when the acquisition was settled mainly by the issue of ordinary shares and/or loan stock at par value. It is a form of accounting (containing certain ingredients of pooling of interests) which is somewhat questionable because it is doubtful whether all of the acquisitions or mergers concerned really reflected purchase prices of less than book value. Fortunately, at least in the survey sample, the practice was fairly limited. (d) The other main practice relating to goodwill was its writing off (or alternatively, its writing back) to reserves or retained profits. This treatment gradually became more widespread during the ten years, particularly from 1967 onwards, and its incidence increased from 49% of companies analysed in 1962 to 58% in 1971. Appendix 5 analyses this movement further, and reveals that the companies using writing off (or writing back) as the primary accounting treatment for goodwill increased considerably over the ten year period from 27% in 1962 to 66% in 1971, whereas those using the technique as a secondary treatment (having accounted, in the first instance, for goodwill as an asset or deduction from reserves) diminished in numbers (that is, from 73% to 34% over the ten year period).

In summary, therefore, it appears from the above analysis that there was no obvious consistency in goodwill practice amongst the analysed companies, although the accounting treatments used tended to fall into two main categories – that is, either the treatment of goodwill as an asset (with or without certain write offs) or its complete and immediate write off to reserves. Indeed the most significant change or development in practice was the gradual but continuous increase in the number of companies either directly or indirectly writing off goodwill to reserves.

¹⁰See Lee, *op cit* [Goodwill], pp.320-321, and McLean, *op cit*, p.50.

4 Description of goodwill

Having established the variety of accounting treatments which existed between 1962 and 1971 amongst the companies analysed, it is not surprising to find a similar flexibility in the descriptions which these same companies gave to the goodwill disclosed in their financial statements. Appendix 6 summarises the wordings used in each year, and shows that five main descriptions were found;¹¹ (a) excess of share cost over book value of assets acquired; (b) premium on acquisition; (c) goodwill on acquisition; (d) goodwill on consolidation; and (e) goodwill (or goodwill, patents, trademarks, etc). There were thirty-five other miscellaneous descriptions, some of which may appear rather similar to the aforementioned ones, but which were sufficiently different to classify separately. These are listed in Appendix 7. Many of them, however, were accompanied by the term goodwill, or supported such a term when it was used in the balance sheet.

It is clearly seen from the figures in Appendix 6 that the variety of descriptions used was enormous; a small number of companies in each year managing to use more than one in their annual reports. However, it is clear that a large majority of the companies in each year favoured the use of one of the five standard phrases mentioned above – 'excess of share cost over book value of assets' and 'premium on acquisition' being consistently used (the respective overall rates for the period being 17% and 20%), with a falling off in usage of the former (from 27% in 1962 to 9% in 1971) and a slight increase in the latter (from 16% in 1962 to 19% in 1971); 'goodwill' being relatively consistently used (with an overall rate for the period of 19%); and 'goodwill on acquisition' and 'goodwill on consolidation' being increasingly used (the former from 4% to 17% over the period, and the latter from 9% to 12%). As with other examples of accounting terminology, there is an obvious and immediate need to reduce the alternative descriptions, many of which must be relatively meaningless to the reader of financial statements unless he has considerable accounting experience (an examination of Appendix 7 provides ample evidence of this point).

5 Valuation bases for goodwill

The next analysis concerns the disclosure of valuation bases for goodwill. As companies are now required to state the valuation bases used in accounting for fixed assets and inventories (through the provisions of the Companies Act 1967) and, more

widely, the accounting policies used in the preparation of financial statements (through the provisions of *Statement of Standard Accounting Practice No. 2*, 'Disclosure of Accounting Policies') it appeared appropriate to find out what policy of disclosure regarding goodwill valuations the survey companies had adopted prior to both the 1967 Act and the aforementioned 1971 Statement.

In the period 1962 to 1971, there was no specific regulation governing goodwill valuation beyond the Companies Act 1948 provision regarding the disclosure of goodwill, patents and trade marks not yet written off. Appendix 8 shows the effect of this lack of prescription, with an almost constant percentage of companies throughout the period giving no information at all about valuation (the overall rate of incidence being 88%). In this instance, the Companies Act 1967 does not appear to have influenced the companies concerned, and all, bar a few, have followed the 'strict letter of the law' and accounted for goodwill at net book value (with no description to this effect), despite the fact that many of them classified goodwill as a fixed or 'other' asset. Cost and aggregate write offs were not separately disclosed, therefore.

6 Values attributed to goodwill as an asset

So far, in this study, the accounting and disclosure of goodwill during the period 1962 to 1971 has been dealt with in generalities to a certain extent. In order to present a more balanced analysis of the available data, the next few sections will look at the values attributed to goodwill in each year by the companies analysed. This is done in order to give the interested reader some indication (a) of the sheer size of the purchased costs being accounted for in each year; and (b) the growth in the size of these costs during the ten year period. Unfortunately, due to the lack of continuity of information for certain companies from year to year because of the unavailability of individual annual reports, it is not possible at this stage to look closely at anything other than individual years, although even this does reveal a great deal about growth and development in goodwill practices over the entire period.

The first analysis in this area deals with annual movements in goodwill values in the companies where disclosed goodwill was treated as an asset, and Appendices 9 and 10 contain the relevant data.

Appendix 9 analyses the annual goodwill asset values relatively generally. By taking the aggregate opening and closing values in each of the specified years (certain companies being omitted because they effectively did not disclose goodwill values when including them with other asset values) it was possible to measure the total increase or decrease in value each

¹¹The wording varied slightly from company to company at times; however, the wording given in Appendix 6 is entirely representative of these various alternatives.

year. From the computed figures, it appears appropriate to give several specific comments. (a) Even allowing for the vast size of the companies being analysed and the lack of continuity in information for certain companies due to lack of available reports, the values attributed to goodwill in each year were considerable, both in total and annual average per company (the closing average per company ranging from £5.09 million in 1962 to £30.93 million in 1971). Ignoring both 1965 and 1967, which were exceptional years affected by large write offs as part of major changes in accounting treatment by certain companies (particularly Watney Mann and Allied Breweries), the analysed data reflect a continuing increase in the goodwill values accounted for and, presumably, a continuing increase in the importance of the associated accounting problems (that is, in relation to how to account for goodwill; what value to disclose; and where to disclose). However, as the figures in Appendix 10 show, the major part of each year's increase or decrease was due to the acquisition or merger activity of a very few large companies, particularly in the years prior to 1969. (b) The period 1962 to 1968 inclusive witnessed a steady but gradual build up in the goodwill asset values accounted for, and 1969, 1970 and 1971 were particularly affected by very large increases, mainly as a result of several major acquisitions and mergers (for example, the 1969 acquisition of English Electric by General Electric). (c) Appendix 10 looks at these value movements in much greater detail, and states all increases and write offs relevant to the analysed companies amounting to more than £5 million per annum. It is interesting to note that, prior to 1969, there were relatively few such major increases amongst the companies analysed, the main ones being due to ICI's total acquisition of British Nylon Spinners reported in 1964; the Reed Group's acquisition of Wall Paper Manufacturers and Polycell Holdings reported in 1966; and Allied Breweries' acquisition of Showerings reported in 1968. These increases were mainly offset by large write offs by Watney Mann, Plessey and Allied Breweries. However, the period since 1969 included many more acquisitions and mergers, and consequent goodwill increases, the most noteworthy being General Electric's acquisition of English Electric reported in 1969; Reed International's acquisition of the International Publishing Corporation reported in 1971; Rank Hovis McDougall's acquisition of Cerebos reported in 1969; EMI's acquisition of the Associated British Picture Corporation reported in 1969; and Grand Metropolitan Hotel's acquisition of Berni Inns and Mecca reported in 1970.

The overriding picture from the above brief

analysis is that, although the 1960s witnessed a continuous business combination activity, the late 1960s and early 1970s saw the largest values being placed on acquired or merged companies, and on the resultant goodwill (for example, over £167 million for goodwill in the case of English Electric when acquired by General Electric in 1969). Because of the vast sums involved, it is not surprising that the companies concerned, in most instances, opted for treating goodwill as an asset and ignoring the alternative of writing it off to reserves. In addition, the nature of the goodwill increases stated in Appendix 10 virtually demanded their classification as assets – from an analysis of those sums exceeding £10 million, it was found that only three of the seventeen companies concerned (Schweppes, Grand Metropolitan Hotels and Courage) revalued certain of the acquired tangible assets, thereby reducing the total value of acquired goodwill to a more realistic level. The other companies' increases may very well, though not necessarily, have represented, at least in part, large undervaluations of tangible net assets at the relevant dates of acquisition. The lack of subsequent amortisation in these and other similar cases, however, as seen in Appendix 11, could well represent nothing more than a flagrant accounting abuse as future profits were not being charged with the additional depreciation which would arise from revalued fixed asset figures – in other words, unamortised goodwill was left in the balance sheet in 'splendid isolation', as in the cases of General Electric, Reed International and Ranks Hovis and McDougall.

7 Values attributed to goodwill as a deduction from reserves

Appendix 12 outlines an entirely similar analysis to that in Appendix 10. It deals with those companies which treated goodwill as a separate deduction from reserves rather than as an asset. The figures, both in total and annual average per company, are remarkably similar to the pattern described in the previous section dealing with goodwill as an asset – annual values gradually getting larger over the period 1962 to 1967 inclusive, and then becoming very much larger from 1968 onwards (the closing average per company in 1962 was £4.63 million rising to a peak of £23.38 million in 1971). Although the figures for each year are large, they have not been affected by such vast increases as affected goodwill asset values. Nevertheless, Appendix 13, describing individual annual increases of over £5 million, does disclose certain very big figures indeed – notably, the 1969 increase of Imperial Tobacco which was mainly due to the acquisition of the Ross Group; and the increase

in the same year of Consolidated Gold Fields mainly due to its acquisition of the Amalgamated Roadstone group of companies. From an analysis of those companies with annual increases of more than £10 million, only one out of six disclosed any revaluation of tangible assets at date of acquisition; a situation again similar to that mentioned in the previous section on asset values.

8 Values attributed to goodwill as a reserve

Few companies in this study valued their subsidiary companies at date of acquisition at less than the book value of the latter entities' net tangible assets, thus having to include the resultant negative goodwill as a reserve in the consolidated balance sheet. Appendix 14 states the average values attributable to the reported negative goodwill of the companies concerned (the closing average per company ranging from £0.91 million in 1962 to £9.37 million in 1971). Once again, due to the lack of continuity of information as a result of the unavailability of individual annual reports or comparative figures, the commentary concentrates more on annual figures than on movements over the period.

The figures in Appendix 14 show that the individual annual values for goodwill treated as a reserve in no way approach the magnitude of those accounted for as assets or deductions from reserves. Indeed, up to and including 1967, those companies which were accounting for negative goodwill as a reserve were dealing with relatively insignificant amounts. However, in the period 1968 to 1971, the figures were much larger, indicating a wider gap between the relevant share values and the corresponding book values of net tangible assets. Nevertheless, the only material movement during the ten year period was attributable to International Computer (Holdings) – £15.69 million of an increase in 1968 due mainly to the acquisition of English Electric Computers (this being written off against an equipment write down by the company in 1970).

9 Total write offs of goodwill

The greatest amount of accounting activity related to goodwill amongst the analysed companies was undoubtedly the writing off (and writing back) of goodwill to reserves or retained profits. As previously mentioned, a large number of companies in each year of the period 1962 to 1971 either wrote off goodwill directly as soon as it arose or indirectly as a diminution in asset or reserve deduction values. Appendix 15 details the annual values relevant to these write offs and write backs (that is, situations involving the

writing off of negative goodwill).

The total amounts written off each year by the companies with available information were considerable in most years, but especially in 1965 and in the period 1967 to 1971 (the average write off per company rising from £1.08 million in 1962 to £3.70 million in 1971). These figures are significant, despite the large number of companies writing off, and especially so in 1967 and 1968 with annual averages per company of £4.36 million and £4.37 million respectively. It should also be noted, in this context, that the average write back figure in 1968 was exceptional due to the large writing back of negative goodwill in that year by BET and Slater Walker.

Appendix 16 looks more closely at the write off annual totals and identifies those companies writing off or back amounts of £5 million or more in each year. Relatively regular large write offs were made throughout the period by ICI and British-American Tobacco but several companies, such as Dunlop, Courtaulds, BP and Slater Walker, also made more than one large write off during the ten year period. Again, as with goodwill asset value increases and goodwill reserve deduction increases, the major contribution in each year came from a relatively few companies – although the numbers did increase substantially from 1968 onwards. Many of the write offs were enormous – for example, ICI's write off of British Nylon Spinners' goodwill reported in 1971; Allied Breweries complete write off of its accumulated goodwill asset on revaluation of its properties reported in 1967; Courtaulds' write off of goodwill in 1968 amounting to more than one half of the total value placed on several acquisitions that year; Dunlop's write off in 1968 of the goodwill attributable to the acquisition in that year of George Angus and Company; English Electric's write off of the goodwill attributable to the acquisition of Elliott-Automation and other companies reported in 1967; Associated British Foods' write off of goodwill mainly due to the acquisition of Allied Farm Foods in 1969; British-American Tobacco's write off of Yardley and Company's goodwill in 1967; and lastly, Watney Mann's write off of its accumulated goodwill asset in 1965. It is noticeable that, in the case of Courtaulds, Dunlop, English Electric, Associated British Foods and British-American Tobacco, a total of £120.61 million was written off in five separate amounts, an average of £24.12 million per company. It appears, therefore, that not even the sheer size of acquisition or merger goodwill deterred company management in these cases from writing off. Thus the figures, obviously highly significant at the dates of acquisition, disappeared from the financial statements, presumably forever.

10 Summary on accounting values for goodwill

Grouping the data analysed in Appendices 9, 12, 14 and 15, it was possible to compute total figures for goodwill values accounted for during 1962 to 1971 either as assets, reserve deductions, reserves or write offs. Appendix 17 summarises these computations, and is intended to give the reader an impression of the importance of the goodwill problem through portraying the total amounts being accounted for in a variety of ways by a small number of very large and important companies in each year of the period 1962 to 1971.

Values attributed to goodwill have obviously increased greatly over the years with a peak in 1969 due mainly to the vast valuation placed on English Electric's goodwill by General Electric. The average annual goodwill accounted for per company has consistently increased over the period, and was well over six times the 1962-63 level by 1971. As previously mentioned, by far the majority of each year's total goodwill has either been accounted for as an asset or as a write off to reserves. These two practices were the most consistently used by the analysed companies throughout the survey period.

One further point seems worthy of attention at this stage, and that is that very few companies disclosed any details of how they arrived at the share premium to be accounted for when an acquisition or merger involved a share exchange and was accounted for on a fair value basis. The share premium determined on acquisition or merger obviously largely determines the total valuation to be accounted for and, thus, the figure to be placed on goodwill. Except in one or two isolated instances, it was impossible to judge the fairness of the relevant share premiums. Therefore, the fairness of the goodwill totals in Appendix 17 is very much dependent on the unknown factor of the fairness of the underlying acquisition or merger valuations, generally, and of any of the share premiums, particularly.

11 Other analyses of goodwill practices and values

The previous ten sections, and particularly the last five, have tended to concentrate on analyses of goodwill practices and values attributable to each of the years in the period 1962 to 1971. Because of the inevitable lack of continuity of analysable information for certain companies, it is not possible to make more than general comments about developments over the period. However, many of the analysed companies did provide sufficient annual reports to allow analyses to be made of their goodwill practices and values over

stipulated periods of time. These periods were 1962 to 1971 (where ten years of data were available), 1967 to 1971 (where five years of data were available) and 1969 to 1971 (where three years of data were available). Appendix 18 states the number of companies analysed in each of these periods, and the following sections look at the nature of the changes in accounting practices for goodwill during the periods; the total goodwill values accounted for by the companies concerned during these periods; and the nature of accounting applied to certain of the more important acquisitions and mergers conducted by some of the analysed companies during the ten year period. In each of the three particular periods, it was thought that there were sufficient companies to provide useful data for general comment.

(a) *Major changes in goodwill practices*

The first period analysis is contained in Appendix 18, and shows that in the period 1962 to 1971 two thirds of the companies concerned made some major change in accounting for goodwill, whereas only a minority of the companies in each of the other two periods had made any changes (that is, 33% and 17% respectively). This gives an indication that any changes which were made tended to occur before or about 1967, a point for analysis which is pursued further on. It is interesting to note, however, the relatively large number of companies which managed to retain consistency of composition, description and treatment of goodwill throughout the periods of analysis.

Appendix 19 analyses the general nature of changes made during the three specified periods. This tabulation reveals that the main changes concerned either description or treatment rather than composition, with the major area of change, not surprisingly, concerning accounting treatment (for example, in the period 1962 to 1971, 76% of the companies analysed had changes in treatment). Appendix 20 analyses these figures still further and shows that, on the whole, most of the companies analysed tended to make only one major change during the period concerned, although some made two, three and even five changes (although these mainly affected descriptions rather than composition or treatment). From the figures in Appendix 20 it can be seen that of the total changes made by the companies concerned, 9% were changes in composition (for example, from goodwill only to goodwill plus consolidation goodwill); 44% were changes in description and 47% were changes in treatment (this will be commented on further, below).

Summarising on the above brief comments on general changes, it is clear that at some time or

another the analysed companies made a major change in accounting for goodwill; that such a change tended to be isolated and therefore infrequent; and that the change either affected the describing or treatment of goodwill in the annual report.

Appendix 21 looks a little more closely at the most important changes in goodwill practice – that is, changes in accounting treatment.¹² The figures in Appendices 18 and 19 indicate that many of these changes may have occurred in or prior to 1967, as the periods 1967 to 1971 and 1969 to 1971 witnessed only a few of the analysed companies making changes in treatment. Appendix 21, however, analyses all companies with changes in accounting treatment, irrespective of whether the data related to the ten, five or three year periods. Using the total number of reported changes in accounting treatment (36 in all, of which 6 occurred during the five year period, 1 during the three year period, and the remaining 29 during the ten year period) it was found that 25% took place in the period 1962 to 1966 and 75% in the period 1967 to 1971. 59% of the latter figure were disclosed in annual reports of 1967 and 1968, and 30% in reports of 1969. Despite the rather mixed nature of the information analysed, it is relatively clear, therefore, that the relevant changes in accounting treatment were made at the time of, or just after, the introduction of the Companies Act 1967.

As Appendix 21 shows, the majority of these accounting changes, both pre and post 1967, meant substitutions of policies of treating goodwill as assets, reserve deductions or reserves for a policy of absolute and immediate write off to reserves (that is, 67% of changes pre 1967 and 56% of changes post 1967 falling into this category). Other changes were sundry in nature, the main one being the change in classification from fixed to 'other' assets.

In summary, therefore, admittedly on the basis of the limited data available, the main changes made in the periods specified related to description and treatment; the majority of the companies concerned only made one major change; and the most important changes of treatment appeared to occur at the time of the Companies Act 1967 being introduced, with changes to a policy of absolute and immediate write off representing the majority of the total.

(b) *Major increases in goodwill values*

Although previous sections of this paper have looked at the total values attributed to goodwill in each year of the period 1962 to 1971, little has been

written of how these values accumulated during the period within individual companies. Appendices 22 and 23 attempt to give some answers to this question as it affects the 'asset' and 'write off' treatments. (The treatment of goodwill as a reserve deduction or as a reserve has not been analysed in this way because of the very limited number of companies with available data.)

Appendix 22 relates to the cumulative increases in goodwill of analysed companies which treated it as an asset throughout the ten year period (that is, for companies with complete information) or throughout the specified five or three year periods (for companies with incomplete information). It reveals that a small number of companies in each of the periods accounted for increases in goodwill asset values of more than £15 million in total. In fact, 10 companies were involved in all, the main ones being General Electric (with a three year increase of £170 million), Reed International (with a five year increase of £65.13 million), Grand Metropolitan Hotels (with a five year increase of £52.81 million), EMI (with a ten year increase of £52.14 million) and Plessey (with a ten year increase of £45.61 million). These figures are very considerable if somewhat exceptional, and obviously the companies concerned were involved on a relatively regular basis in acquisitions and mergers with extremely high valuations. The size of figures for accumulated goodwill are given as a sharp reminder of the importance of the goodwill problem in accounting, and the need for acceptable and generally recognised practices.

Appendix 23 outlines a similar analysis relevant to the writing off of goodwill. As in the case of asset increases, the majority of companies concerned in each of the specified periods were accounting for total goodwill values of less than £15 million. Indeed, a sizeable percentage (37% in 1962–71, 50% in 1967–71 and 25% in 1969–71) were writing off less than £5 million in total. However, the tabulation does show, once again, that the high values attributed to the goodwill accounted for in this way reflect, to a great extent, the importance of the topic – for example, ICI, which regularly wrote off goodwill over the ten year period, averaged £7.17 million a year; British-American Tobacco and Courtaulds, pursuing the same accounting policy over the same period, averaged £5.83 and £5.42 million per annum, respectively; and Allied Breweries, writing off over five years, averaged £7.86 million per annum.

12 Summary and Recommendations

The above eleven sections on accounting for goodwill can be summarised as follows:

¹²It was thought that an analysis of the changes in composition would not provide much useful data; and that an analysis of the changes in description would be too complex to be meaningful.

(a) Summary of findings

(1) A relatively consistent and sizeable number of analysed companies in each year of the period 1962 to 1971 made no mention of goodwill. However, a majority did disclose its existence, mainly in the form of that arising on consolidation.

(2) A large number of these companies treated goodwill as an asset, with an increasingly large number writing it off to reserves either immediately or occasionally. A few companies accounted for it as a reserve deduction or as a reserve.

(3) The majority of companies used, relatively consistently, one or other of five main descriptions of goodwill. However, there were a considerable number of miscellaneous descriptions used as well.

(4) Most companies throughout the ten year period failed to disclose the basis of valuation of goodwill.

(5) So far as goodwill asset values were concerned, the increases were very large, indicating enormous acquisition costs, particularly in the late 1960s. Few of the companies concerned subsequently amortised these large sums. Indeed, in most instances, goodwill may well have included undervaluations of acquired tangible assets, thus affecting future depreciation provisions particularly.

(6) A similar pattern to that in (5) occurred with goodwill values treated as reserve deductions.

(7) Only a few companies accounted for their acquisitions in such a way as to produce negative goodwill.

(8) The greatest amount of goodwill accounting activity concerned write offs to reserves; the relevant total and average values tending to increase in size throughout the ten year period. Obviously, the great size of some of the individual figures concerned did not deter management from pursuing a policy of write off.

(9) Generally, due to lack of disclosure, it was impossible to judge either the fairness of acquisition values, particularly as related to share premiums, or the fairness of the resultant goodwill figures.

(10) The majority of companies analysed made at least one major change in accounting policy regarding goodwill during the ten year period. The most significant changes occurred around the time of the introduction of the Companies Act 1967. The main changes in treatment involved a move to immediate and absolute write off to reserves.

(11) For those companies with sufficient information, it was seen that the cumulative increases in goodwill asset values and write offs could be enormous, thereby emphasising the importance of the goodwill problem and the need to look for greater acceptability and uniformity in practices.

(b) Recommendations

The following points are recommended for consideration as improvements in existing practices connected with accounting for goodwill.

(1) Both Wyatt¹³ and Catlett and Olson¹⁴ have argued very forcibly for the abandonment of pooling accounting. This approach is strongly supported in this paper, for pooling is open to too many abuses. It also ignores the logic of the fact that all business combinations are acquisitions of one company by another, and thus involve acquisition costs. It appears entirely inconsistent to account for purchase values on a fair valuation basis for all business transactions except those which are probably the largest and certainly the most important to date in the lives of the relevant companies. It is therefore recommended that all business combinations be accounted for on a fair value basis (assuming, of course, that fair values can be reasonably determined).

(2) However, if purchase accounting is to be meaningfully used by all companies, it is recommended that the following conditions should also be fulfilled.

(i) The fair value should be disclosed, and the basis for arriving at it fully explained. This information should be given in the notes accompanying the financial statements, and should therefore be subject to audit. (This sort of disclosure would give the reader of the statements information about the fairness of the share premium (if any) and, thus, of goodwill.)

(ii) Goodwill arising on a business combination should be in the first instance treated as an asset – the classification of ‘neither fixed nor current’ appearing most appropriate because of goodwill’s intangible nature. Goodwill represents purchased resources with presumed long-term lives if properly maintained, and therefore should be accounted for as such.

(iii) When goodwill is accounted for as an asset, movements in its accounting value during any particular year should be properly disclosed and explained – that is, details of additions, disposals and revaluations should be given. In addition, the cumulative write off (if any) should be separately disclosed.

(iv) Before accounting for goodwill as an asset, the excess of the total acquisition value over the book value of the tangible assets acquired should be allocated firstly to the appropriate tangible assets,

¹³Wyatt, *op cit.*

¹⁴George R. Catlett and Norman O. Olson, ‘Accounting for Goodwill’, *Accounting Research Study No. 10*, AICPA, 1968.

leaving the balance to represent the intangibles to be accounted for as goodwill. This would allow the acquired tangible assets to be more realistically depreciated in the future. Presumably, company managements do make an appraisal of tangible asset values for purposes of a business combination, and therefore these values should be available for purchase accounting.

(v) Goodwill, computed and accounted for as above, should not be amortised or written off unless the directors of the company concerned have good reason to do so. They should disclose their reasons for amortisation or write off if they decide to account in this way. Again, such disclosures should form part of the audited financial statements.

(vi) Goodwill should be given some generally acceptable description such as 'goodwill arising on acquisition of subsidiary companies, representing the fair valuation placed upon non-separable and intangible resources purchased as part of such acquisitions'.

(3) There will be situations, particularly on the 'merging of giant streams', when purchase accounting will adversely affect the distribution of divi-

dends by the holding company due to the freezing of subsidiary company pre-acquisition reserves. In these cases, it should be permissible for such reserves to be used for dividend purposes, but only with the prior approval of a court of law or, alternatively, the Department of Trade and Industry. The value of the holding company's 'Investment in Subsidiary Company' should be correspondingly written down as soon as the post-acquisition reserves of the holding company are sufficient to do so.

(c) Conclusions

These recommendations are perhaps not ideal – for example, they completely ignore the value problems associated with historic cost accounting. However, within the terms of contemporary financial accounting and reporting, they are offered in order to increase the usefulness of information describing business combinations and goodwill, and to minimise existing abuses and inconsistencies, as evidenced in this first survey in depth of UK practices. More important, they are advocated in order to accelerate the growing debate arising out of such abuses and inconsistencies.

Appendix 1

Companies circularised

Taken from *The Times* 1000: 1971-72 (companies with year-ends up to and including 30 June 1971) and ranked on the basis of size of capital employed.

1. The Shell Transport and Trading Co. Ltd.
2. The British Petroleum Co. Ltd.
3. Imperial Chemical Industries Ltd.
4. British-American Tobacco Co. Ltd.
5. Rio Tinto Zinc Corporation Ltd.
6. The Burmah Oil Co. Ltd.
7. The General Electric Co. Ltd.
8. Unilever Ltd.
9. Imperial Tobacco Group Ltd.
10. Courtaulds Ltd.
11. British Leyland Motor Corporation Ltd.
12. Esso Petroleum Co. Ltd.
13. Shell Mex and BP Ltd.
14. The Distillers Co. Ltd.
15. Bass Charrington Ltd.
16. Reed International Ltd.
17. Allied Breweries Ltd.
18. Guest Keen and Nettlefolds Ltd.
19. The Dunlop Co. Ltd.
20. The Peninsular and Oriental Steam Navigation Co. Ltd.
21. The Bowater Paper Corporation Ltd.
22. Tube Investments Ltd.
23. Ford Motor Co. Ltd.
24. Hawker Siddeley Group Ltd.
25. Great Universal Stores Ltd.
26. The Associated Portland Cement Manufacturers Ltd.
27. Coats Patons Ltd.
28. British Insulated Callenders Cables Ltd.
29. Philips Electronic and Associated Industries Ltd.
30. Whitbread and Co. Ltd.
31. Sears Holdings Ltd.
32. Charter Consolidated Ltd.
33. Watney Mann Ltd.
34. Consolidated Gold Fields Ltd.
35. British Oxygen Co. Ltd.
36. Cadbury Schweppes Ltd.
37. Marks and Spencer Ltd.
38. Tate and Lyle Ltd.
39. Thorn Electrical Industries Ltd.
40. The Plessey Co. Ltd.
41. F. W. Woolworth and Co. Ltd.
42. Rank Hovis McDougall Ltd.
43. Courage Ltd.
44. Associated British Foods Ltd.
45. Pilkington Bros. Ltd.
46. The Rank Organisation Ltd.

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| 47. Trust Houses Forte Ltd. | 74. Reckitt and Colman Ltd. |
| 48. The Metal Box Co. Ltd. | 75. Beecham Group Ltd. |
| 49. The Ocean Steam Ship Co. Ltd. | 76. Dalgety Ltd. |
| 50. Lonrho Ltd. | 77. English Calico Ltd. |
| 51. Grand Metropolitan Hotels Ltd. | 78. London Merchant Securities Ltd. |
| 52. Joseph Lucas (Industries) Ltd. | 79. The Delta Metal Co. Ltd. |
| 53. The British and Commonwealth Shipping Co. Ltd. | 80. Unigate Ltd. |
| 54. The British Electric Traction Co. Ltd. | 81. Spillers Ltd. |
| 55. EMI Ltd. | 82. IBM United Kingdom Holdings Ltd. |
| 56. J. Lyons and Co. Ltd. | 83. Standard Telephones and Cables Ltd. |
| 57. Boots Pure Drug Co. Ltd. | 84. The Cunard Steam-ship Co. Ltd. |
| 58. Rank Xerox Ltd. | 85. The Dickinson Robinson Group Ltd. |
| 59. Vauxhall Motors Ltd. | 86. Alcan Aluminium (UK) Ltd. |
| 60. Gallaher Ltd. | 87. Debenhams Ltd. |
| 61. Vickers Ltd. | 88. The Union International Co. Ltd. |
| 62. Turner and Newall Ltd. | 89. Trafalgar House Investments Ltd. |
| 63. International Computers (Holdings) Ltd. | 90. Gulf Oil (UK) Ltd. |
| 64. Scottish and Newcastle Breweries Ltd. | 91. The Burton Group Ltd. |
| 65. Furness Withey and Co. Ltd. | 92. English China Clays Ltd. |
| 66. Glaxo Group Ltd. | 93. Mobil Oil Co. Ltd. |
| 67. Brooke Bond Liebig Ltd. | 94. Arthur Guinness Son and Co. Ltd. |
| 68. Thomas Tilling Ltd. | 95. Reyrolle Parsons Ltd. |
| 69. Albright and Wilson Ltd. | 96. Johnson Matthey and Co. Ltd. |
| 70. S. Pearson and Son Ltd. | 97. Continental Oil Holdings Ltd. |
| 71. Texaco Ltd. | 98. Imperial Continental Gas Association |
| 72. Slater Walker Securities Ltd. | 99. Rowntree Mackintosh Ltd. |
| 73. United Drapery Stores Ltd. | 100. Chrysler United Kingdom Ltd. |

Appendix 2

Companies with disclosure of acquisitions, etc., but no disclosure of goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|------|------|------|------|------|------|------|------|------|------|
| Number of companies with disclosure of acquisitions or mergers | 24 | 30 | 35 | 33 | 43 | 42 | 45 | 53 | 53 | 58 |
| Percentage companies with disclosure of acquisitions, etc., and disclosure of goodwill | 92 | 97 | 94 | 91 | 95 | 95 | 93 | 96 | 92 | 93 |
| Percentage companies with disclosure of acquisitions, etc., but no disclosure of new goodwill or movements in existing goodwill | 8 | 3 | 6 | 9 | 5 | 5 | 7 | 4 | 8 | 7 |

Appendix 3

Composition of goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|------|------|------|------|------|------|------|------|------|------|
| Number of companies with disclosure of goodwill | 45 | 43 | 45 | 46 | 52 | 58 | 60 | 66 | 66 | 66 |
| Percentage companies disclosing consolidation goodwill only | 58 | 65 | 60 | 65 | 67 | 70 | 75 | 71 | 73 | 71 |
| Percentage companies disclosing consolidation and non-consolidation goodwill | 42 | 35 | 40 | 35 | 33 | 30 | 25 | 29 | 27 | 29 |

Appendix 4

Accounting treatment of goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|------|------|------|------|------|------|------|------|------|------|
| Number of companies with disclosure of goodwill | 45 | 43 | 45 | 46 | 52 | 58 | 60 | 66 | 66 | 66 |
| Percentage companies disclosing goodwill as a fixed asset | 31 | 30 | 27 | 24 | 19 | 26 | 20 | 15 | 14 | 14 |
| as neither a fixed asset nor a current asset | 24 | 21 | 22 | 28 | 25 | 26 | 28 | 29 | 27 | 32 |
| as a separate deduction from reserves | 18 | 19 | 22 | 22 | 21 | 16 | 12 | 9 | 9 | 9 |
| as a reserve | 13 | 12 | 11 | 9 | 8 | 10 | 10 | 11 | 9 | 8 |
| as a write off to profits retained or reserves | 49 | 44 | 40 | 50 | 42 | 57 | 55 | 62 | 62 | 58 |
| Percentage companies with two accounting treatments for goodwill in one year | 35 | 22 | 22 | 29 | 11 | 31 | 25 | 26 | 21 | 21 |
| Percentage companies with three accounting treatments for goodwill in one year | — | 2 | — | 2 | 2 | 2 | — | — | — | — |

Appendix 5

Preliminary analysis of companies writing off goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|------|------|------|------|------|------|------|------|------|------|
| Number of companies disclosing write offs to reserves | 22 | 19 | 18 | 23 | 22 | 33 | 33 | 41 | 41 | 38 |
| Percentage companies with direct write off to reserves | 27 | 47 | 45 | 39 | 68 | 45 | 58 | 61 | 66 | 66 |
| Percentage companies with write off from assets, reserve deductions, etc. | 73 | 53 | 55 | 61 | 32 | 55 | 42 | 39 | 34 | 34 |

Appendix 6

Descriptions attributed to goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|------|------|------|------|------|------|------|------|------|------|
| Number of companies with disclosure of goodwill | 45 | 43 | 45 | 46 | 52 | 58 | 60 | 66 | 66 | 66 |
| Percentage companies using 'excess of share cost over book value of assets' | 27 | 23 | 22 | 17 | 15 | 17 | 15 | 17 | 17 | 9 |
| Percentage companies using 'premium on acquisition' | 16 | 19 | 16 | 22 | 21 | 21 | 23 | 19 | 23 | 19 |
| Percentage companies using 'goodwill on acquisition' | 4 | 2 | 2 | 2 | 6 | 5 | 15 | 14 | 14 | 17 |
| Percentage companies using 'goodwill on consolidation' | 9 | 7 | 7 | 9 | 6 | 9 | 12 | 9 | 14 | 12 |
| Percentage companies using 'goodwill' (or 'goodwill, patents, etc.') | 22 | 23 | 13 | 17 | 19 | 21 | 13 | 18 | 18 | 26 |
| Percentage companies using miscellaneous descriptions | 33 | 35 | 43 | 41 | 38 | 38 | 33 | 33 | 27 | 24 |
| Percentage companies using two descriptions | 11 | 9 | 3 | 8 | 5 | 7 | 11 | 10 | 13 | 7 |
| Percentage companies using three descriptions | — | — | — | — | — | 2 | — | — | — | — |

Appendix 7

Miscellaneous descriptions of goodwill

1. Excess of share cost over value attributable to net tangible assets at acquisition.
2. Excess of cost of shares over balance sheet values.
3. Excess of share cost over par value of shares.
4. Excess purchase consideration over net book value of assets on acquisition of shares in subsidiaries.
5. Excess of price paid over tangible assets taken over.
6. Excess of purchase price over net assets of subsidiaries acquired during year.
7. Excess of nominal value of shares over book value.
8. Excess of net asset value over cost of shares.
9. Excess of net assets over cost of acquisition of subsidiaries.
10. Goodwill including net excess of cost of shares in subsidiary companies over their net tangible assets at dates of acquisition.
11. Goodwill on consolidation – excess of price paid over tangible assets taken over.
12. Excess of cash and nominal value of shares over net assets.
13. Book value of shares less book value of assets.
14. Book value of shares in subsidiary companies less nominal value of these shares less pre-acquisition profits and reserves.
15. Excess cost of acquisition.
16. Cost of control – excess of market value of securities over book value of assets acquired.
17. Excess arising on consolidation.
18. Difference arising on consolidation.
19. Net surplus on acquisition.
20. Surplus arising on consolidation.
21. Deficit on consolidation.
22. Adjustment arising on acquisition of subsidiaries.
23. Adjustments arising on consolidation.
24. Adjustments in respect of shares acquired in subsidiary companies.
25. Goodwill arising on merger.
26. Capital reserve on consolidation.
27. Consolidation reserve.
28. Consolidation balance.
29. Capital reserve on acquisition.
30. Premiums less discounts on acquisition.
31. Reserves arising on consolidation – adjustments for subsidiary companies formed or acquired.

32. Goodwill arising on incorporation of book value of net assets of subsidiary companies in consolidation balance sheet.
33. Goodwill in respect of acquisitions and consolidation adjustments arising on incorporation
34. Goodwill representing net cost of book values over par values of shareholdings.
35. Goodwill representing premiums at which stocks and shares in subsidiary companies held.

Appendix 8

Valuation bases for goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|------|------|------|------|------|------|------|------|------|------|
| Number of companies with disclosure of goodwill | 45 | 43 | 45 | 46 | 52 | 58 | 60 | 66 | 66 | 66 |
| Percentage companies with goodwill stated at cost | 2 | 2 | 9 | 4 | 8 | 5 | 7 | 6 | 9 | 8 |
| cost less amounts written off | 18 | 14 | 7 | 7 | 6 | 7 | 7 | 5 | 6 | 6 |
| nominal valuation | — | — | — | — | — | — | 2 | 2 | — | — |
| Percentage companies with no reference to valuation basis | 87 | 88 | 84 | 89 | 86 | 88 | 84 | 91 | 89 | 89 |
| Percentage companies with two valuation bases | 7 | 4 | — | — | — | — | — | 4 | 4 | 3 |

Appendix 9

Values attributed to goodwill as an asset

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|------|------|------|--------|-------|--------|-------|-------|-------|-------|
| Number of companies disclosing goodwill as an asset | 25 | 22 | 22 | 24 | 23 | 30 | 29 | 29 | 27 | 30 |
| Number of companies not disclosing a separate asset value for goodwill | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| Number of companies disclosing a separate asset value for goodwill | 23 | 20 | 20 | 22 | 21 | 28 | 28 | 28 | 26 | 29 |
| Average closing value per company (£ millions) | 5.09 | 6.01 | 8.34 | 8.50 | 11.74 | 9.98 | 11.14 | 22.08 | 27.87 | 30.93 |
| Average increase (decrease) per company (£ millions) | 0.13 | 0.78 | 2.74 | (0.85) | 1.71 | (0.87) | 1.02 | 10.53 | 3.33 | 4.89 |

(Appendix 10 – see p. 191)

Appendix 11

Amortisation of goodwill

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|------|------|------|------|------|------|------|------|------|------|
| Number of companies disclosing a separate asset value for goodwill | 23 | 20 | 20 | 22 | 21 | 28 | 28 | 28 | 26 | 29 |
| Percentage companies amortising goodwill | 13 | 15 | 10 | 14 | 14 | 14 | 11 | 14 | 15 | 17 |

Appendix 10

Significant movements in values attributed to goodwill as an asset

| Year | Total number of companies with goodwill value as asset | Increase (or decrease) in goodwill value during year (£ millions) | Company | Significant increases Amount (£ millions) | Company | Significant write offs Amount (£ millions) | Net significant increase or (decrease) (£ millions) |
|------|--|--|--------------------|---|-------------------|--|---|
| 1962 | 23 | 3.03 | Plessey | 9.57 | General Electric | 7.14 | 2.43 |
| 1963 | 20 | 15.53 | ICI | 38.70 | Imperial Tobacco | 11.66 | — |
| 1964 | 20 | 54.76 | Watney Mann | 8.78 | | | |
| | | | Plessey | 6.74 | | | |
| 1965 | 22 | (18.75) | Coats Patons | 6.80 | Watney Mann | 19.06 | 42.56 |
| | | | Spillers | 6.19 | Plessey | 11.00 | |
| 1966 | 21 | 36.04 | Reed Group | 26.45 | EMI | 7.50 | (24.57) |
| 1967 | 28 | (24.39) | EMI | 9.94 | | | 26.45 |
| 1968 | 28 | 28.46 | Allied Breweries | 20.41 | Allied Breweries | 38.79 | (36.15) |
| | | | Schweppes | 10.06 | Dunlop | 7.30 | |
| 1969 | 28 | 294.78 | General Electric | 170.77 | Tube Investments | 14.68 | 15.79 |
| | | | R H McD | 48.56 | | | |
| | | | EMI | 38.78 | Cadbury Schweppes | 11.15 | |
| | | | BICC | 15.95 | | | |
| | | | Beecham | 13.03 | | | |
| | | | BET | 10.32 | | | |
| | | | Reckitt & Colman | 8.94 | | | |
| | | | J Lyons | 6.66 | | | |
| | | | Whitbread | 6.50 | | | |
| | | | Allied Breweries | 6.32 | | | |
| 1970 | 26 | 86.55 | Grand Met. | 36.43 | | — | 314.68 |
| | | | EMI | 15.18 | | | |
| | | | Plessey | 9.93 | | | |
| | | | Coats Patons | 6.95 | | | |
| | | | Gallaher | 6.47 | | | |
| 1971 | 29 | 141.74 | Reed International | 61.48 | ICI | 38.70 | 74.96 |
| | | | Plessey | 31.22 | | | |
| | | | Grand Met. | 29.59 | Grand Met. | 12.34 | |
| | | | ICI | 15.40 | | | |
| | | | Courage | 10.85 | | | |
| | | | Trafalgar | 9.45 | | | |
| | | | Beecham | 8.07 | | | |
| | | | Gallaher | 5.23 | | | 120.25 |

Appendix 12**Values attributed to goodwill as a deduction from reserves**

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|------|------|------|------|------|------|-------|-------|-------|--------|
| Number of companies disclosing goodwill as a deduction from reserves | 8 | 8 | 10 | 10 | 11 | 9 | 7 | 6 | 6 | 6 |
| Number of companies not disclosing a separate value for goodwill as a deduction from reserves | 1 | 1 | 1 | 1 | 1 | 1 | 1 | — | — | — |
| Number of companies disclosing a separate value for goodwill as a deduction from reserves | 7 | 7 | 9 | 9 | 10 | 8 | 6 | 6 | 6 | 6 |
| Average closing value per company (£ millions) | 4.63 | 5.72 | 4.53 | 4.60 | 5.75 | 8.13 | 11.88 | 21.88 | 23.03 | 23.38 |
| Average increase in value per company (£ millions) | 0.62 | 1.09 | 1.00 | 0.07 | 1.12 | 1.99 | 1.01 | 9.98 | 1.15 | (0.28) |

Appendix 14**Values attributed to goodwill as a reserve**

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|--------|------|--------|------|--------|------|------|--------|--------|------|
| Number of companies disclosing goodwill as a reserve | 6 | 5 | 5 | 4 | 4 | 6 | 6 | 7 | 6 | 5 |
| Number of companies not disclosing a separate value for goodwill as a reserve | 1 | 1 | 1 | 1 | 1 | 1 | — | — | — | 1 |
| Number of companies disclosing a separate value for goodwill as a reserve | 5 | 4 | 4 | 3 | 3 | 5 | 6 | 7 | 6 | 4 |
| Average closing value per company (£ millions) | 0.91 | 1.05 | 0.83 | 2.53 | 1.15 | 1.12 | 9.65 | 8.43 | 6.92 | 9.37 |
| Average increase (decrease) per company (£ millions) | (0.13) | — | (0.47) | 1.53 | (1.38) | 0.04 | 4.27 | (0.65) | (2.91) | 1.23 |

(Appendix 13 — see p. 193)

Appendix 15**Total write offs of goodwill**

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|------|------|------|------|------|------|------|------|------|------|
| Number of companies writing off goodwill reserves | 18 | 17 | 17 | 20 | 20 | 31 | 30 | 38 | 38 | 35 |
| Number of companies writing back goodwill to reserves | 4 | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| Average write off per company (£ millions) | 1.08 | 0.28 | 1.60 | 3.34 | 0.72 | 4.36 | 4.37 | 2.75 | 2.06 | 3.70 |
| Average write back per company (£ millions) | 0.81 | 2.30 | 0.93 | 0.29 | 4.25 | 0.61 | 7.47 | 2.96 | 0.15 | 1.87 |

Appendix 13

Values attributed to goodwill as a deduction from reserves

| Year | Total number of companies with goodwill as a deduction from reserves | Increase (or decrease) in goodwill value during year (£ millions) | Significant increases | | Significant write offs | | Net significant increase or (decrease) (£ millions) |
|------|--|---|--------------------------------------|---------------------|------------------------|---------------------|---|
| | | | Company | Amount (£ millions) | Company | Amount (£ millions) | |
| 1962 | 7 | 4.36 | — | — | — | — | — |
| 1963 | 7 | 7.63 | — | — | — | — | — |
| 1964 | 9 | 0.86 | — | — | — | — | — |
| 1965 | 9 | 0.62 | Bowater | 8.55 | — | — | 8.55 |
| 1966 | 10 | 11.15 | Assoc. Portland GKN | 15.76 | — | — | — |
| | | | | 10.83 | — | — | — |
| 1967 | 8 | 15.97 | Burmah Oil Imperial Tobacco GKN | 6.99 | — | — | 33.58 |
| | | | | 13.46 | — | — | — |
| 1968 | 6 | 6.08 | Burmah Oil Imperial Tobacco | 5.07 | Bowater | 9.43 | 18.53 |
| | | | | 6.58 | — | — | — |
| 1969 | 6 | 59.89 | Imperial Tobacco Consol. Gold Fields | 5.18 | — | — | 2.33 |
| | | | | 31.30 | — | — | — |
| 1970 | 6 | 6.90 | Imperial Tobacco | 27.47 | — | — | 58.77 |
| 1971 | 6 | (1.66) | — | 10.45 | — | — | 10.45 |

Appendix 20

Regularity of changes in goodwill practices

| | 1962-71 | | | 1967-71 | | | 1969-71 | | |
|---|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|
| | Changes in composition | Changes in description | Changes in treatment | Changes in composition | Changes in description | Changes in treatment | Changes in composition | Changes in description | Changes in treatment |
| Number of companies with major changes | 5 | 17 | 22 | 1 | 3 | 4 | 1 | 2 | 1 |
| Percentage companies with one major change only | 100 | 35 | 82 | 100 | 33 | 50 | 100 | 100 | 100 |
| Percentage companies with two or more major changes | — | 65 | 18 | — | 67 | 50 | — | — | — |

Appendix 16

Total write offs to goodwill

| Year | Total number of companies writing off and back goodwill | Total goodwill written off or back (£ millions) | Significant direct write offs | | Significant indirect write offs (from assets, reserves, etc.) | | Total significant write offs (£ millions) |
|------|---|---|-------------------------------|------------------------|--|------------------------|--|
| | | | Company | Amount (£ millions) | Company | Amount (£ millions) | |
| 1962 | 22 | 16.13 | — | — | General Electric | 7.14 | 7.14 |
| 1963 | 19 | 0.18 | — | — | — | — | — |
| 1964 | 18 | 26.28 | — | — | Imperial Tobacco | 11.66 | 11.66 |
| 1965 | 23 | 65.93 | ICI | 8.00 | Watney Mann | 19.06 | |
| | | | | | Plessey | 11.00 | |
| | | | | | EMI | 7.50 | 45.56 |
| 1966 | 22 | 5.93 | English Electric | (8.04) | — | — | (8.04) |
| 1967 | 33 | 134.07 | English Electric | 23.05 | Allied Breweries | 38.79 | |
| | | | BAT | 19.97 | Dunlop | 7.30 | |
| | | | ICI | 12.60 | | | |
| | | | BP | 12.00 | | | |
| 1968 | 33 | 108.69 | Courtaulds | 32.53 | Tube Investments | 14.68 | 113.71 |
| | | | Dunlop | 23.78 | Bowater | 9.43 | |
| | | | Unilever | 14.10 | | | |
| | | | Tube Investments | 11.32 | | | |
| | | | Trafalgar | 7.49 | | | |
| | | | BET | (10.39) | | | |
| 1969 | 41 | 95.77 | Slater Walker | (10.15) | | | 92.79 |
| | | | Assoc. British Foods | 21.28 | | | |
| | | | Courtaulds | 13.94 | Cadbury Schweppes | 11.15 | |
| | | | BAT | 13.85 | | | |
| | | | Vickers | 10.20 | | | |
| | | | RTZ | 5.83 | | | |
| 1970 | 41 | 77.81 | BAT | 11.19 | — | — | 76.25 |
| | | | BP | 8.90 | | | |
| | | | Lucas | 5.94 | | | |
| | | | Slater Walker | 5.24 | | | |
| 1971 | 38 | 123.87 | Sears Holdings | 13.80 | ICI | 38.70 | 31.27 |
| | | | Burton | 11.42 | Grand Met. | 12.34 | |
| | | | Trafalgar | 10.80 | | | |
| | | | Delta Metal | 5.82 | | | |
| | | | ICI | 5.00 | | | 97.88 |

Appendix 17**Summary of accounting values for goodwill**

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
|--|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| Total number of companies accounting for goodwill | 45 | 43 | 45 | 46 | 52 | 58 | 60 | 66 | 66 | 66 |
| Number of companies not disclosing any specific value for goodwill | 2 | 2 | 2 | 2 | 2 | 2 | 1 | — | — | — |
| Number of companies disclosing specific values for goodwill | 43 | 41 | 43 | 44 | 50 | 56 | 59 | 66 | 66 | 66 |
| Total amount of goodwill accounted for (£ millions) | 24.17 | 23.34 | 83.78 | 43.22 | 57.26 | 125.46 | 117.70 | 455.02 | 188.75 | 259.01 |
| Average amount of goodwill accounted for per company (£ millions) | 0.56 | 0.57 | 1.95 | 0.98 | 1.15 | 2.24 | 2.00 | 6.89 | 2.86 | 3.92 |

Appendix 18**Companies with major changes in goodwill practices during specified periods**

| | 1962-71 | 1967-71 | 1969-71 |
|--|---------|---------|---------|
| Number of companies with sufficient information to analyse goodwill practices and values over the periods stated | 48 | 18 | 12 |
| Number of companies with no reference to goodwill | 5 | — | — |
| Number of companies referring to goodwill during the periods stated | 43 | 18 | 12 |
| Percentage companies with uniform composition, description and accounting treatment of goodwill throughout the period stated | 33 | 67 | 83 |
| Percentage companies with major changes in composition, description or treatment of goodwill during the period stated | 67 | 33 | 17 |

Appendix 19**Nature of changes in goodwill practices**

| | 1962-71 | 1967-71 | 1969-71 |
|---|---------|---------|---------|
| Number of companies with major changes in composition, description or treatment during the period | 29 | 6 | 2 |
| Percentage companies with major changes in composition | 17 | 17 | 50 |
| Percentage companies with major changes in description | 59 | 50 | 100 |
| Percentage companies with major changes in accounting treatment | 76 | 67 | 50 |

(Appendix 20 — see p. 193)

Appendix 21**Analysis of changes in accounting treatment**

| | Pre 1967 | Post 1967 |
|--|----------|-----------|
| Total number of changes in accounting treatment | 9 | 27 |
| Percentage changes to a policy of write off | 67 | 56 |
| Percentage changes not involving a policy of write off | 33 | 44 |

Appendix 22**Increases in goodwill asset values over time**

| | <i>1962-71</i> | <i>1967-71</i> | <i>1969-71</i> |
|--|----------------|----------------|----------------|
| Number of companies with sufficient data for analysis | 43 | 18 | 12 |
| Percentage companies not accounting for goodwill as an asset during period | 63 | 56 | 50 |
| Percentage companies with total increases in goodwill asset value during period as follows: (figures to nearest £1 million) | | | |
| 0·00 to 4·00 | 5 | 11 | 8 |
| 5·00 to 9·00 | 5 | — | 8 |
| 10·00 to 14·00 | 12 | 10 | 8 |
| 15·00 or more | 15 | 23 | 26 |

Appendix 23**Total amounts written off goodwill over time**

| | <i>1962-71</i> | <i>1967-71</i> | <i>1969-71</i> |
|---|----------------|----------------|----------------|
| Number of companies with sufficient data for analysis | 43 | 18 | 12 |
| Percentage companies with no goodwill written off during period | 16 | 22 | 50 |
| Percentage companies writing off the following amounts of goodwill during period (figures to nearest £1 million): | | | |
| 0·00 to 4·00 | 37 | 50 | 25 |
| 5·00 to 9·00 | 5 | 11 | 8 |
| 10·00 to 14·00 | 14 | 6 | 8 |
| 15·00 or more | 28 | 11 | 9 |

The practising chartered accountant - job attitudes and professional values

Adrian Buckley and Eugene McKenna

This paper is concerned with various aspects of the professional accountant's working environment. The findings presented here flow from a small field survey* of chartered accountants in professional offices. The areas that we have sought to examine can be separated under four broad headings – these are as follows:

- the key influences affecting choice of professional accountancy as a career.
- how membership of the profession affects the accountant's views and values; in other words the extent to which the professionalisation process has influenced the respondents in the sample.
- levels of job satisfaction experienced by accountants employed in the professional office.
- management styles in the professional office.

The method used in the investigation involved first the mailing of a very simple one-page questionnaire to fifty randomly selected managers in chartered accountants' offices in London. Subsequent to this stage, a visit to the offices of accountants in the sample was arranged and an interview, of up to three hours duration, with respondents ensued.

Out of the 50 managers selected, 30 agreed to participate in the survey. Inevitably we would have preferred to have a greater number upon which to base our conclusions. However, even without the confidence of large numbers certain patterns have emerged¹, and it is these patterns that we report on in this paper.

The presentation of our results follows under the respective headings of choice of career, professionalisation, job satisfaction and management style. In each of these areas a short summary of the pertinent literature precedes a description of the line of questioning used in this survey and the results thereof.

Choice of Career

Career choice is a function of a number of factors such as intelligence, special aptitudes, past experiences, satisfactions and frustrations, attitudes and other personality variables. Many of the satisfactions and frustrations which have a noticeable impact on subsequent vocation occur early in life.

According to some authorities,² in choosing a career a person is basically identifying that role model or occupational stereotype that most readily fits in his own perception of himself. This may involve identification in childhood or adolescence with an adult who acts as a role model. Or it may involve choosing a job which family and friends regard favourably. The interest an individual claims in an occupation may vary directly with the degree of acceptance of the occupational stereotype as self-descriptive or self-enhancing, and one would expect the individual to show a high interest in an occupation in which he perceives a stereotype closely approximating the vocational self-concept which he has, or would like to have. Whilst we would not dispute that career choice implies matching one's perception of oneself with the stereotype, we believe

* We would like to thank the staff of 'Accounting and Business Research' and 'Accountancy' for their aid and endorsement of this survey. In particular Geoffrey Holmes and Sally Makovski lent us their frequent help. We also thank all respondents for their time and very frank comments.

¹ We would be the first to acknowledge that our sample would have to be greater if we are to be confident about our findings. Nonetheless we would defend them as being indicative.

² For example, D. E. Super, 'A Theory of Vocational Development', *American Psychologist*, 8, 1953.

M. E. Englander, 'A Psychological Analysis of Vocational Choice – Teaching', *Journal of Consulting Psychology*, Vol. 7 No. 4, 1960.

E. S. Bordin, 'A Theory of Vocational Interests as Dynamic Phenomena', *Education Psychology Measurement*, 1943.

D. H. Blocher and R. A. Schutz, 'Relationships among Self-Descriptions, Occupational Stereotypes and Vocational Preferences', *Journal of Counselling Psychology*, Vol. 8, No. 4, 1961.

that the process is by no means as simple as all that; we say this for two reasons. First, one rarely has a perfect match between the self-concept and the stereotype, therefore inevitably some suboptimisation must be involved. Secondly we feel intuitively that even though there may be a very good fit between self and stereotype, necessarily other constraints, such as desire for a given salary, etc. may play a decisive role in career choice.

In our investigation in the area of vocational choice, respondents were asked to rank in order of importance a number of reasons for choosing their career.

As can be seen from Table 1, which reports how respondents described their first three rankings in terms of importance for career choice, by far the prime influence is the promise of job satisfaction. Closely followed in order of emphasis given is the desire to secure favourable financial reward. Probably these two facets of reward for professional work are transmitted by parents and society to those who are likely to pursue professional accountancy as an occupation. The benefits of job interest and financial reward were probably stressed in one form or another by force of example or advice earlier in life so as to create the necessary level of aspiration and ambition to pursue and persevere in the chosen career. Next in order of importance is the attraction of professional status marginally ahead of numeracy, although the latter is more frequently quoted as the main influence, apparently following aptitude in arithmetic at school. The image of the chartered accountant appeared, in a number of cases, to be sufficiently attractive to have influenced favourably respondents in their choice of occupation. Also the probability of security was mentioned – the reasoning being that the chartered accountant was always in demand and guaranteed a reasonable standard of living. Respondents also mentioned that qualification as a professional accountant gave an element of flexibility inasmuch as the qualification could act as a launching pad to a broad spectrum of line management positions but clearly, because the sample was selected from

respondents based in professional offices, this feature had not been widely capitalised upon. Although few of the sample appeared to have followed the career of a parent, the role model of a friend or relative – frequently a successful uncle – was mentioned. We had anticipated that a greater proportion of our sample would be ‘following father’s footsteps’; perhaps, had the total population from whom the respondents were drawn included partners, our finding may have been different. Nonetheless there appears to be sufficient evidence to identify the role of the stereotype (image) of the chartered accountant and its influence in pointing the aspirant towards his choice of professional accountancy as a career. This tends to endorse the postulation of the stereotype advanced by Bordin and by Blocher and Schutz.³

Determinants of vocational choice occupied a natural introduction to our survey of professional accountants. It seemed logical next to examine the development and adoption of professional values; this process is termed professionalisation.

Professionalisation

Many writers⁴ have attempted, with varying success, to develop an adequate description of the characteristics implied by the term ‘profession’. Generally such descriptions crystallise along the lines that professions are organised for the performance of duties and are distinguished by the possession of a skill, requiring training and education and based on theoretical knowledge, competence in which is demonstrated by passing a test. In the last analysis,

³ E. S. Bordin, *Ibid.*

D. H. Blocher and R. A. Schutz, *Ibid.*

⁴ G. Millerson, ‘The Qualifying Associations, A Study in Professionalisation’, Routledge and Keegan Paul, 1964.

E. Greenwood, ‘The Elements of Professionalisation’, in ‘Professionalisation’, edited by H. M. Vollmer and D. L. Mills, Prentice-Hall, 1966.

Joseph Ben-David, ‘Professions in the Class System of Present Day Societies’, *Current Sociology*, 12, 1963.

E. C. Hughes, ‘The Study of Occupations’, in ‘Sociology Today, Problems and Prospects’, edited by R. K. Merton, L. Broom and J. S. Cottrell Jnr, Basic Books, 1959.

TABLE 1
Determinants of Career Choice

| | <i>Ranked first by</i> | <i>Ranked second by</i> | <i>Ranked third by</i> |
|--------------------------------------|----------------------------|-----------------------------|----------------------------|
| | % | % | % |
| Promise of job satisfaction | 57 | 23 | 3 |
| Favourable financial reward | 27 | 23 | 17 |
| Status of professional practice | 3 | 23 | 30 |
| Numerate nature of accountancy | 13 | 7 | 10 |
| Image of the chartered accountant | — | 10 | 13 |
| Security of employment | — | 7 | 10 |
| Flexibility offered by qualification | — | 7 | 10 |
| Following parent's occupation | — | — | 7 |

as Millerson⁵ points out, 'to achieve professional status the occupation must be accepted as a profession by the whole or part of society'.

It is widely acknowledged that during the course of his training the professional develops attitudes towards the practice of his chosen vocation which colour his professional vision and affect his approach to the reality of the work situation. This process of socialisation, by which members of the profession subscribe to the values and beliefs nurtured by the professional group, is termed professionalisation. Millerson⁶ states that 'as with other forms of institutionalisation, professionalisation entails conformity, internalisation and sanction of specific norms, in this case by members of a particular occupation.' Once accepted as a qualified member of the professional group, the individual conforms by subscribing to group norms and accepting the implied special obligations to colleagues, client and the public.

Thus values exist to which professionals adhere. In an empirical study of the value system of chartered accountants and their attachment to values developed whilst undergoing training, Hastings⁷ states that 'from our previous description of the professional socialisation process which the embryo chartered accountant undergoes during articles we might expect him to develop the following values bearing on his work situation:

- Caution – a preference for certainty, predictability and avoidance of risk.
- Exactitude – a preference for the maximum attainable precision in output independent of the cost and value of achieving it.
- Anti-theoretical pragmatism – a preference for conventional approaches to problems, and for experience rather than theory.
- Professional exclusiveness – a preference for the qualities of chartered accountants when compared with those of other accountants.
- Quantification – a preference for numerical methods of working and items which can be quantified.
- Rationality – a preference for systematic logical approaches to problem-solving as opposed to other methods such as intuition.'

Although Hastings' study is specific to the chartered accountant's value system, the findings, in our opinion, also have relevance to other qualified accountants and to the finance function in industry. We would argue that, over time, chartered accountants have contributed, in no small way, to the moulding and shaping of the work and social environment within the finance function either internally as executive accountants or externally as auditors. Hence accountants other than chartered accountants are likely to possess similar professional values in certain areas, e.g. caution, anti-theoretical pragmatism, quantification and rationality. Relating his findings to industrial accountancy Hastings maintains that adherence to quantification is generally functional, but adherence to caution, exactitude and anti-theoretical pragmatism is, on balance, dysfunctional. Caution may manifest itself in the industrial or commercial world in an undue amount of checking of figures and records. The accountant who is very attached to caution may be ill-prepared to cope with decisions in the work situation as he moves up the organisational pyramid. As Tricker⁸ states: 'the real accusation levelled at the accountant is that he maintains the attitudes he had at the bottom of the pyramid when dealing with situations nearer the top. The question is one of the extent of risk-taking and uncertainties in the environment. The accountant, cradled in the nursery of certainty, has a great hurdle to overcome when attempting to grapple with uncertainty. The accountant in management has to graduate from his schooling in certainty, through the assessment of probabilities to dealing realistically in uncertainty'. Examples of dysfunctional exactitude in the business environment are figurings to the *n*th decimal place where 'to the nearest £000' may suffice. Anti-theoretical pragmatism, in the business situation can be evidenced, among many other instances, in the failure to approach decision problems on an incremental basis.

At the professional level attachment to anti-theoretical pragmatism helps to explain much about stagnation in the development of a framework of financial accounting. Preference for experience rather than theory may lie at the heart of the profession's failure to get to grips with financial reporting relevant to the needs of existing and potential shareholders rather than merely detailing stewardship in the traditional manner.

Similarly the accountant's preference for caution (allied to anti-theoretical pragmatism) may explain the emphasis and attachment in accounting theory to the so-called principle of conservatism.

⁵ G. Millerson, *Ibid.*

⁶ G. Millerson, *Ibid.*

⁷ A. Hastings, 'The Chartered Accountant in Industry. A Study of Values.' Unpublished PhD Thesis, University of Birmingham, 1968.

⁸ R. I. Tricker, 'The Accountant in Management', Batsford, 1967.

Turning now to the results of our enquiry, a number of questions, including some which cross-checked answers to others, were posed to respondents; these aimed at identifying the extent of their subscription to and preference for the values of caution, exactitude, anti-theoretical pragmatism, professional exclusiveness and quantification. We also took the opportunity to examine accounting managers' perceptions of the adequacy of the professional training of the chartered accountant. The results of this line of enquiry are reported in Table 2.

It can be seen that, as one would expect, accountants show a very clear preference for quantification in dealing with problems; as one respondent observed 'numerical ways of thinking and working are developed during the period of articles'. Our respondents exhibited a strong tendency towards anti-theoretical pragmatism, a reliance on experience rather than theory, a preference for the status quo as opposed to innovation in accounting and auditing. Some typical comments were 'for the average shareholder, present rules on disclosure in published accounts are more than adequate. After all most shareholders don't even look at or understand the accounts anyway', 'published accounts are fairly good these days' and 'accounts based on historical costs are the only objective way to present information'. Beginning to discuss the adequacy of published accounts one respondent said 'this is a theoretical and practical subject which I could talk for hours on'; in reality after two minutes he had run out of ideas. The table also shows caution and exactitude to be clearly identified traits of the professional accountant. Chartered accountants generally perceive their fellow members as possessing 'better education' – both general and professional – 'higher professional integrity', 'more social presence', 'greater independence of mind', and 'a wider breadth of business vision' than their certified and cost and management counterparts. Typical comments on these aspects

described the chartered accountant as 'more polished', 'better class', 'more confident'; in other words, many of the sampled accountants were highly prejudiced. One respondent said that 'the industry-trained certified or cost and management accountant has to compromise professional standards because of industrial pressures, and his breadth of commercial vision is limited to only one company'; the same respondent went on to say (with reference to the certified and cost and management accountant) 'the ones trained in professional offices are OK'. This sentiment was widely echoed by many of the chartered accountants in our sample. Summarising on this point, the typical respondent was remarkably biased. Given this sort of view, we believe that if integration of the leading bodies of accountants in the UK is to take place it would seem that a concerted effort at enlightening the typical manager in the chartered accountant's office must precede his support for a unified profession.

Table 2 also reports that although the typical chartered accountant believes his training to be superior to that provided by the other accountancy bodies, he is generally critical – see Table 2 – of the existing system of training for the profession; learning by way of correspondence course came under particular fire, preference for block release throughout the period of articles of clerkship being stressed. The following comment, from a respondent, is typical of many. 'The system of training is totally inadequate. Standards are falling; it's too easy to qualify. The success of the crammers is an indictment of the system'. Whilst the articulated clerk's full-time course of nine months was universally welcomed by the managers with whom we spoke, there was some criticism of its products. More than one manager said that many of them displayed a lack of knowledge of double-entry bookkeeping. We deduce from our discussions with accountants sampled that they were anticipating too much from the articulated clerk who

TABLE 2
Professionalisation of Accountants

| | <i>Agree Strongly</i> % | <i>Agree</i> % | <i>Disagree</i> % | <i>Disagree Strongly</i> % | <i>Total</i> % |
|---|--------------------------------|-------------------|----------------------|-----------------------------------|-------------------|
| Preference for quantification | 50 | 47 | 3 | — | 100 |
| Anti-theoretical pragmatism (as evidenced by attachment to accounting based on historic cost, existing standards in published financial reports, and lack of interest in concepts from subjects other than finance) | | | | | |
| is beneficial | 23 | 47 | 23 | 7 | 100 |
| Desirability of caution | 30 | 52 | 12 | 6 | 100 |
| Desirability of exactitude (necessity of maximum attainable precision) | 27 | 40 | 23 | 10 | 100 |
| Superiority of the chartered accountant | 37 | 47 | 10 | 6 | 100 |
| Existing training for the profession is adequate | 10 | 20 | 37 | 33 | 100 |

had completed the course inasmuch as they expected him to be immediately operational.

To summarise this section of our investigation, our findings are congruent with Hastings' conclusion that the typical chartered accountant exhibits caution, exactitude, anti-theoretical pragmatism, professional exclusiveness and a preference for quantification.

Job Satisfaction

Under the heading of vocational choice we looked, in an exploratory way, at reasons underpinning chartered accountants' decisions to take up their chosen occupation. It will be recalled that the pursuit of job satisfaction was widely ranked as the prime influence of career choice. In this section we report further on the actuality of achieved job satisfaction in the working environment of chartered accountants comprising the sample studied.

Essentially this aspect of the survey was concerned with testing the applicability of Herzberg's⁹ motivational theory to respondents in the sample.

Herzberg's theory, empirically based although there are dissentient views¹⁰ to his findings, is that the individual in the job situation has two groups of needs which are independent of one another and affect behaviour in different ways. Dissatisfaction is most likely to arise from elements in the job environment. These hygiene, or extrinsic factors include:

- company and policy administration
- supervision
- salary
- inter-personal relations
- working conditions

Changes in these factors may lower dissatisfaction but they will not increase satisfaction. In other words, lack of adequate 'job hygiene' will cause dissatisfaction, but the presence of job hygiene will not, of itself, cause satisfaction. It is the motivators that do this, and here Herzberg includes intrinsic factors which are concerned essentially with the job itself; these are:

- achievement
- recognition for accomplishment
- challenging work
- responsibility
- advancement

Changes in these factors can motivate people to higher performance.

It should be pointed out that, in Herzberg's empirical experiments, salary was the most ambiguous of all factors – sometimes motivator, sometimes hygiene factor – but the negative element tended to predominate. Looking at money considerations further – as most of us do – Herzberg's view would be that money must be right, otherwise dissatisfaction can be guaranteed. But the two-factor argument continues to demonstrate that money and other hygiene factors are not enough.

According to the Herzberg thesis, job satisfaction and job dissatisfaction are not opposites. The opposite to job satisfaction is not job dissatisfaction but no job satisfaction; the opposite to job dissatisfaction is lack of job satisfaction. Herzberg's message is that if the employer wants real job motivation, he must stress positively intrinsic factors in job design, that is job enrichment.

During our survey we attempted to identify determinants of job satisfaction. If one subscribes to Herzberg's thesis one would have expected the intrinsic job factors to be the key motivators. Our survey tends to endorse this. However financial reward, although an extrinsic factor, was frequently highly placed as a determinant of job satisfaction.

The results of asking respondents to rank in order of importance a number of alternative factors influencing job satisfaction is shown in Table 3.

The tabulated results which show that respondents stressed intrinsic factors – achievement, development, recognition – as their main influences of job satisfaction, tend to endorse the Herzberg thesis. But unlike Herzberg, in whose studies salary was ambiguous, we found financial reward to be a positive motivator. Perhaps the fact that professional accountants stress financial reward so highly, both as a determinant of job satisfaction (see Table 3) and also as a key factor in career choice (see Table 1) suggests that accountants tend towards materialism. Indeed this conclusion is in line with the finding of McDougall¹¹, who in an empirical study of motivation among senior business executives observed that accountants' aspirations tend to cluster in the 'material reward' and 'status/prestige' areas of motivation – other goals were categorised in the McDougall study as 'leadership', 'variety/challenge', 'job interest/vocation', and 'security/social'.

In the course of our work on job satisfaction we also studied how levels of job satisfaction varied

⁹ F. Herzberg, B. Mausner and B. Snyderman, 'The Motivation to Work', Wiley, 1959. F. Herzberg, 'Work and the Nature of Man', World Publishing Co., 1966.

¹⁰ See for example J. R. Hinrichs and L. A. Mischkind, 'Empirical and Theoretical Limits to the Two-Factor Hypothesis of Job Satisfaction', *Journal of Applied Psychology*, Vol. 51, No. 2, 1957; Paul F. Wernimont, 'Intrinsic and Extrinsic Factors in Job Satisfaction', *Journal of Applied Psychology*, Vol. 50, No. 1, 1966; V. H. Vroom and N. R. F. Maier, 'Industrial School of Psychology', *Annual Review of Psychology*, No. 12, 1961.

¹¹ Camilla McDougall, 'An Approach to the Study of Values and Motivation', unpublished paper given at Ashridge Management College, July 14th, 1972.

TABLE 3
Determinants of Job Satisfaction

| | <i>Ranked First by %</i> | <i>Ranked Second by %</i> | <i>Ranked Third by %</i> | <i>Ranked Fourth by %</i> |
|---|--------------------------------------|---------------------------------------|--------------------------------------|---------------------------------------|
| Feeling of achievement as a result of the work | 43 | 13 | 10 | 13 |
| Opportunity to develop oneself and one's career | 20 | 17 | 23 | 17 |
| Recognition for doing one's job well | 17 | 44 | 27 | 3 |
| Financial rewards | 10 | 20 | 20 | 27 |
| Good organisation | 7 | — | 17 | 7 |
| Varying venues of work | 3 | — | 3 | 17 |
| Pleasant work contacts | — | 3 | — | 10 |
| Good working conditions | — | 3 | — | 3 |
| Security of Employment | — | — | — | 3 |

according to management style used in the professional office. We now examine the impact of management style further.

Management Style

Many writers on organisations have attempted to conceptualise management style and its effectiveness. In this part of the paper we outline only the approach adopted in our survey of chartered accountants. This draws upon the work of Sadler¹² who distinguishes four discrete styles, namely 'tell', 'sell', 'consult', and 'join', the characteristics of which are as follows:

- Tell: 'The manager who employs this style habitually makes his own decisions and announces them to his subordinates, expecting them to carry them out without question'.
- Sell: 'The manager using this approach also makes his own decisions but rather than simply announce them to his subordinates, he tries to persuade his subordinates to accept them. Recognising the possibility of resistance on the part of those who will be faced with the decisions, he seeks to reduce this by "selling" them'.
- Consult: 'Where the manager uses this style he does not make his decisions until he has presented the problem to members of the group and listened to their advice and suggestions. The decision is still his but he does not take it until after he has consulted his staff'.

- Join: 'This approach to leadership involves delegating to the group (which includes the manager himself as a member) the right to make decisions. The manager's function is to define the problem and to indicate limits within which the decision must be made. Normally the decision will reflect majority opinion in the group once the problem has been freely discussed'.

Sadler found that managers who were rated highest for efficiency, discipline and decisiveness were those who were perceived by their subordinates as exercising a 'tell' style of leadership. Managers who were rated highest for certain important human relations qualities and job skills were perceived by subordinates as exercising a 'consult' approach. This participative style was correlated significantly with a high level of job satisfaction.

Turning now to the results of our survey, our questions, formulated bearing in mind the above management styles, were devised:

- to determine the style perceived to apply in the respondent's environment, the style preferred by the respondent, and his own style as applied in managing the work of subordinates.
- to highlight the level of job satisfaction by management style.
- to identify the psychological closeness between partner and manager in relation to the management style perceived to prevail.
- to assess the effectiveness of the partner in supervising the work of managers in relation to the management style perceived to prevail.
- to assess whether loyalty to the firm varied according to management style.

Table 4 shows that when asked to indicate the style of management which most closely corresponded to that in their own firms, respondents most frequently identified the 'sell' style, although most

¹² P. J. Sadler, 'Leadership Style, Confidence in Management and Job Satisfaction', Ashridge Management College, 1966, which in turn draws on the leadership continuum advanced in R. Tannenbaum and W. H. Schmidt, 'How to choose a Leadership Pattern', Harvard Business Review, Vol. 36, No. 2, 1958.

preferred and reckoned that they used the 'consult' style. The 'join' style was the least preferred style, and not one respondent reported that it was the perceived style or his adopted style.

Following questioning designed to highlight whether the level of experienced job satisfaction varied according to the perceived management style, we identified very little variation, although a high level of satisfaction was recorded for all leadership style. On an index basis – with 100 representing maximum job satisfaction – our findings are shown in Table 5 below. At the start of our survey we anticipated that either the 'tell' style or the 'join' style would score lowest (no one in our survey perceived the 'join' style as applying in their office) but we anticipated the 'consult' style as being the probable highest scorer. We then attempted, via a series of questions to identify how close psychologically¹³ the managers sampled were to the partner to whom they reported. According to their answers a score based on a maximum of 100 was calculated – 100 would be closest, 0 would be as distant as possible – and such scores were analysed according to the perceived management style. It appeared – see Table 5 – that the more democratic the management style, the better the relationship between partner and manager. Similarly a series of questions were devised to determine the view of respondents on their superiors' management effectiveness. Again an index based on a maximum score of 100 was used and it transpired that the democratic 'consult' style produced the best rating on perceived effectiveness of the partner. We also tested the satisfaction of managers with the firm for whom they worked in

terms of their loyalty; once again an index basis was used. This time the 'sell' and 'consult' styles produced the best average rating, and the autocratic 'tell' style was clearly the management style with the lowest score.

From this section of our study we conclude that managers in accounting offices prefer democratic consultative management, although it must be pointed out that half of those who prefer this style are not operating in this environment. There is also some slight evidence to suggest that the consultative style is more effective in creating a psychologically close, effective working relationship.

Conclusions

Our conclusions span job choice, professionalisation, job satisfaction, and management style with respect to the chartered accountant in the professional office. On the question of job choice we do not consider an exercise of this kind to be anything other than an approximate indicator of factors bearing on career decisions. With this reservation, it appeared that respondents claimed that the major influences were the promise of job satisfaction, financial reward, the status of the chartered accountant and the numerical nature of accountancy. The influence of parents and friends in cultivating a favourable image of accountancy in the mind of the young aspirant was clearly identified, and there was evidence of the role model and the stereotype in channelling the would-be accountant towards the profession. Examining the impact of the professionalisation process we concluded that, like the earlier study of Hastings, the typical chartered accountant exhibits caution, exactitude, anti-theoretical pragmatism, professional exclusiveness and a preference for quantification. Next we looked at determinants of job satisfaction, and here the role of the intrinsic

¹³ This measure is similar to that employed by F. Fiedler, 'A Theory of Leadership Effectiveness', McGraw-Hill, 1967, to gauge the social distance between leader and least preferred co-worker.

TABLE 4
Management Style in Accountants' Offices

| <i>Figures in %</i> | <i>'Tell'</i> | <i>'Sell'</i> | <i>'Consult'</i> | <i>'Join'</i> | <i>Total</i> |
|---------------------|---------------|---------------|------------------|---------------|--------------|
| Perceived | 20 | 47 | 33 | — | 100 |
| Preferred | — | 27 | 67 | 6 | 100 |
| Adopted | 13 | 27 | 60 | — | 100 |

TABLE 5
The Working Environment By Management Style

| <i>(Index basis – 100 max)</i> | <i>'Tell'</i> | <i>'Sell'</i> | <i>'Consult'</i> |
|-------------------------------------|---------------|---------------|------------------|
| Level of job satisfaction | 80 | 86 | 82 |
| Psychological closeness to partner | 75 | 79 | 91 |
| Managerial effectiveness of partner | 69 | 69 | 88 |
| Loyalty to firm | 65 | 91 | 88 |

factors as motivators was clearly apparent. However, financial reward, an extrinsic factor, was frequently said to be a strong positive motivator. The fact that professional accountants stress financial reward so highly, both as a determinant of job satisfaction and also as a key influence in career choice, underpins the earlier finding of Camilla McDougall that accountants

fall into a category for whom material reward is one of the prime motivators in their business career. Lastly on the question of management style, it appeared that most respondents prefer democratic consultative management, although only half of those who preferred it were actually operating in this environment.

Accounting Fundamentals: Guides to Human Judgment

George Gibbs

'Accounting: A Crisis Over Fuller Disclosure' is the title of the lead article in a recent business weekly widely circulated in the United States.¹ The brilliantly coloured cover shows a well-worn post binder ledger, so familiar to accountants. As *disclosure* is not reducible to hard and fast rules, mathematical formulae nor computer languages, it must be considered as a concept and not a matter of numerical data. Disclosure is only one of several concepts which can be developed into a useful body of accounting knowledge. These ideas may best be called *fundamentals*.

A fundamental is defined as 'a basic principle which serves as a groundwork of a system'.² Thus it seems reasonable to discuss and use the term 'fundamentals' rather than 'principles', especially since the term 'principles' has, in the United States, been associated with the official phrase, used in the standard auditor's report letter, namely 'generally accepted accounting principles'.³ This phrase has been construed to include detailed rules and procedures as well as 'principles'.⁴ The American Institute of Certified Public Accountants has ruled that 'generally accepted accounting principles' are 'principles that have substantial authoritative support' and that 'opinions of the Accounting Principles Board constitute substantial authoritative support'.⁵

Many of these opinions are really explanations of detailed procedures to be followed, and are not basic to the understanding of accounting. In many of the published pronouncements there are sets of alternative procedures, but no conclusions as to which is recommended.

What is the importance of this matter and why is it significant at this time? In the United States it is particularly important as a new seven-man, full-time, paid board has been appointed, to be known as the Financial Accounting Standards Board, to replace the 18-man, unpaid Accounting Principles Board of the American Institute of Certified Public Accountants, which has been active since 1959.⁶

This board is the result of the Wheat Committee, which held public hearings on the matter November 3 and 4, 1971 in New York. The author testified at this meeting and stated that, in his opinion, a new board would have to distinguish between *fundamentals* and *procedures*, as the fundamentals (sometimes called principles) should be the body of knowledge used to judge the efficacy of the procedures. Therefore, by definition they are two entirely separate concepts and need to be delineated by all groups discussing these matters.⁷

The Wheat Committee received oral and written testimony from more than 125 firms and individuals. Those testifying represented both the practitioners, large and small, and consumers of financial reports. The position of one large non-CPA group of accountants was published in the journal *Management Accounting*, along with a summary of the oral testimony given at the public hearings.⁸ It is noted

¹ *Business Week*, 'Accounting: A Crisis Over Fuller Disclosure,' (New York, Number 2225, April 22, 1972), p. 55.

² *The Random House Dictionary of the English Language* (New York, Random House, Inc., 1966), p. 574.

³ George Gibbs, 'Accounting Principles: "Generally Accepted" by Whom?', *Accounting and Business Research*, (Number 1, Winter 1970), p. 40.

⁴ In the interest of clarity the following definitions may be helpful: a 'procedure' is a particular course of action or mode of conducting affairs, Random, *op. cit.*, p. 1146 modified. A 'rule' is a regulation or formal order governing the conduct of affairs, Random, *op. cit.*, p. 1252.

⁵ American Institute of Certified Public Accountants, *APB Accounting Principles*, Two volumes (Chicago, Commerce Clearing House, Inc., 1968); Vol. 2, p. 6621.

⁶ Wheat Committee Report on the 'Establishment of Accounting Standards,' AICPA, March 29, 1972.

⁷ George Gibbs, testimony before the Wheat Committee of the AICPA, November 3, 1971, entitled 'Establishment of Accounting Principles,' 8 p.

⁸ National Association of Accountants, 'Major Changes Urged in APB Rules Making,' *Management Accounting* (Vol. LIII, No. 7, January, 1972), p. 12.

that this group referred to 'rules', *not* 'principles'.

It has been recommended by one partner of an international auditing firm that the term 'generally accepted accounting principles' be dropped immediately. Experience with the Internal Revenue Code in the United States leads to the conclusion that improved financial reports are not likely to come from 'detailed mandatory prescriptions'.⁹ In the entire world accounting is important as the means of reporting economic events, in all segments of society, including business, government and not-for-profit organisations. The events in any one country are of interest to persons in other countries so that the *fundamentals* underlying the reporting procedures should be agreed upon internationally.¹⁰

If the *fundamentals* are delineated and understood, then there will be a basis for judging the usefulness of the choices of *procedures*,¹¹ and the validity of adherence to *rules*, which are often established by governmental agencies.¹² It is suggested that the term *practice* be reserved for *all* of the activities of the accountant, as the use has developed in the United States. (It is said that a certified public accountant sells or merges his 'practice'.) The proper use of these terms is important and it is urgent that the entire world adopt the same definitions, so that communication becomes possible. In this connection certain studies have been made from an international point of view. The Accountants International Study group has published a report on three nations.¹³ P. N. McMonnies, Chartered Accountant of Scotland, commented succinctly on this study by reminding that the phrase 'generally accepted accounting principles' includes accounting practices and conventions as well as principles and, at least to some extent, the methods of applying such principles and practices'. He further notes that nowhere in the report is there an example or a definition of a 'principle'.¹⁴

Worldwide Accounting

There are now many books on accounting in various countries and a published bibliography on inter-

national accounting.¹⁵ However most articles and books on international accounting really cover national accounting in specific countries, other than that of the author, which is not the same as international accounting. The AICPA has published a book on accounting in 25 countries¹⁶ and an international auditing firm has published a guide for 24 countries to assist the reader of financial statements.¹⁷ An interesting dichotomy is evident in this booklet in that the differences between the practices in the particular country and those of the United States are in two categories, 'accounting' and 'disclosure', yet under accounting in several countries 'over-conservatism' is listed under accounting and not under disclosure.

A recent short article entitled 'Toward Worldwide Accounting Principles', in the New York CPA Journal, indicates a continued interest in international accounting, and offers suggestions for the next five years. It mentions items to be disclosed and suggests that differences in 'accounting principles' need to be resolved including 'interperiod allocation of taxes'. Disclosure seems, to this author, to be a fundamental, as defined above, but certainly interperiod allocation of taxes is a procedure, not a fundamental.¹⁸ None of these, or other publications, has really approached the problem of international accounting. This would be a body of knowledge common to the various countries, not a compendium of various national systems now in use throughout the world. The need is with us, but it is not being answered at present.

The Fundamentals of Accounting

A review of the publications of several writers¹⁹ and of carefully prepared statements of the AICPA and the American Accounting Association, which represent some of the best accounting thought in the United States, shows that what might be called

⁹ A. Carl Tietjen of Price Waterhouse and Co., New York. Testimony before the Wheat Committee.

¹⁰ *Op. cit.*, George Gibbs, 'Accounting Principles: "Generally Accepted" by Whom?'

¹¹ A procedure is defined as 'a particular course of action or mode of conducting business' *op. cit.* Random House, p. 1146.

¹² For the most part the word rule could be reserved for the details of the pronouncements of government agencies.

¹³ Accountants International Study Group, *The Independent Auditor's Reporting Standards in Three Nations* (New York, AICPA, 1969). (This is the second of four studies that have been completed and more are in process.)

¹⁴ P. N. McMonnies, 'Accountants are an Unprincipled Lot': True or False? *The Accountant's Magazine*, Edinburgh, Scotland (LXIII, June 1969), p. 325.

¹⁵ Gerhard G. Mueller, *A Bibliography of International Accounting* (Seattle, Washington, University of Washington, 1968).

¹⁶ AICPA, *Professional Accounting in 25 Countries*, (New York, AICPA, 1964).

¹⁷ Price Waterhouse and Co., *Guide for the Reader of Foreign Financial Statements* (New York, Price Waterhouse and Co., 1971).

¹⁸ George C. Watt, 'Toward Worldwide Accounting Principles,' *The CPA Journal*, (New York, CPA Society, Volume XLII, Number 8, August, 1972), p. 652.

¹⁹ William J. Vatter, 'Postulates and Principles,' *Journal of Accounting Research* (1, Autumn, 1963), p. 196. American Accounting Association, *A Statement of Basic Accounting Theory* (Evanston, Illinois, 1966), p. 7. Robert T. Sprouse and Maurice Moonitz, 'A Tentative Set of Broad Accounting Principles,' *Accounting Research Study No. 3* (New York, American Institute of Certified Public Accountants, 1962), p. 7. Thomas R. Prince, *Extension of the Boundaries of Accounting Theory* (Cincinnati, Ohio, Southwestern Publishing Co., 1963), p. 57.

fundamentals have been referred to as doctrines, standards, guidelines, postulates, concepts, and principles. Taking these all together the 'essential elements' might include:

- appropriateness
- comparability
- conservatism
- consistency
- continuity
- determination of income
- disclosure (also 'full' disclosure)
- freedom from bias
- going concern versus liquidation
- materiality
- objectivity
- quantifiability
- relevancy
- uniformity
- verifiability

The length of this list alone should warrant the careful attention of all accountants throughout the world, because these and other words have led to great misunderstanding. The judge in a recent case (1969) stated that:

'The first law for accountants was not compliance with generally accepted accounting principles but, rather, full and fair disclosure, fair presentation and, if principles did not produce this brand of disclosure, accountants could not hide behind the principles but had to go behind them and make whatever disclosures were necessary for full disclosure. In a word, "present fairly" was a concept separate from "generally accepted accounting principles", and the latter did not necessarily result in the former.'²⁰

This decision involved only a few of the elements listed above, but clearly established the idea that adherence to the present body of dogma, with its conflicts and permitted alternatives, did not lead to 'fair disclosure' and 'fair presentation'. This also means that the accountant has to use his *judgment* as to what is to be disclosed and in what manner this is to be done.

Since this and other court cases, involving accountants in the United States, have been decided, there have been many articles in the press, and a quote regarding this element of judgment is warranted:

'Accounting is not a precise body of rules covering every case that comes up. It is a set of general principles - some of them going back to the Middle Ages and the invention of double-entry

book-keeping - applied in the manner that the accountant on a particular job thinks appropriate. Inevitably, it contains a large component of personal judgment.'²¹

The chairman of Arthur Andersen and Co., Certified Public Accountants, suggests that time is of the essence for the accounting profession, due to the challenges made by various groups and the seeming confusion that exists. He stated, early in 1972, that:

'The accounting profession probably has only one more chance to do what clearly is necessary, and we can all hope that this chance will not again be wasted. If the present challenges which confront us are not squarely faced and a proper procedure for determining accounting principles is not developed, the accounting profession, as we know it, will surely disappear. Reliable financial data about business entities is so necessary to the users of such information and to the welfare of the free-enterprise system that other means will be found to satisfy this need if we accountants do not succeed.'²²

This statement refers to accounting of the free enterprise system, but the remarks could be applied equally to accounting in the entire economy, including the other two segments, government and not-for-profit organisations.

Professor Popoff, of New Zealand, recently proposed an accounting system of postulates, principles, and rules related to the accounting function in society.²³ Included in his system are many of the 'elements', discussed above, including comparability, consistency, materiality, and going concern ('continuity of entity'). In addition he has a postulate of 'economic truth' which is the 'criterion for determining the relevance and validity of analysis and interpretation'.²⁴ Disclosure is not considered in his system unless it is contained in 'economic truth' but he states that 'Central to the theory is the postulate of "economic truth". No attempt has been made to define "economic truth". . . . What is "appropriate" accounting practice as at a particular point of time will give the practical substance of the term "economic truth"'.²⁵ He does not include 'disclosure' in his system which the writer thinks is the most important fundamental to be considered. However, he may include 'disclosure' as part of

²¹ Business Week, *op. cit.*, p. 55.

²² Harvey E. Kapnick, Jr., 'Responsibilities of the Accounting Profession,' *Management Accounting* (Vol. LIII No. 9, March 1972), p. 21.

²³ Boris Popoff, 'Postulates, Principles and Rules' *Accounting and Business Research* (No. 7, Summer 1972), p. 182.

²⁴ Ibid, p. 185.

²⁵ Ibid, p. 192.

²⁰ U.S. Second Court of Appeals, Judge Henry J. Friendly in the Continental Vending decision. (U.S. vs. Simon, 425 F2nd 796, (2d Cir. 1969)).

'economic truth' but it seems vital to be specific as to 'disclosure' and especially the judgment required to determine what to disclose.

Judgment

Before discussing the fundamentals it seems appropriate to discuss the element of judgment as it is by this means that human beings can make use of the fundamentals to decide if the proper procedures have been employed and whether the rules have been followed.

In the auditor's report letter, used in the United States, is the phrase 'in our opinion the financial statements present fairly'. An opinion is the result of human judgments, several in fact, as there are several portions of a financial statement that are the result of such judgment. If financial statements are the result of judgment, then we cannot put in writing specific procedures resulting in numerical choices. We can only put in writing guidelines to assist the person preparing the statement to exercise judgment. One reason accounting is called a profession is because the practitioners must exercise judgment. Obviously if certain portions of a financial statement are the result of judgment, made by human beings, it is quite probable that different persons will produce different results but if the guidelines employed are adequate then the results should not vary significantly.

The element of judgment exists in the preparation of financial statements in all segments of the world economy but the emphasis is on the business segment because of the nature of private investments. The individual investor is interested in the results of his investment and the taxing authorities are interested in their share of income based upon a calculation known as 'taxable income'. The citizen rarely sees the financial statements of the various governments with which he is involved. Perhaps this is partly because most citizens do not request data showing the results of their sacrifice in terms of taxes.

The demand by donors for financial statements of not-for-profit organisations is probably even less than the demand for government statements. Perhaps due to this lack of demand the statements of government and not-for-profit organisations are prepared in an even more perfunctory manner than are those for the private segment of the economy. Many procedures have been issued for the preparation of the private statements, yet the business world is far from satisfied with the results to date.

The element of judgment has been in the public notice recently because two large lawsuits have been filed. The first suit totalling \$25,000,000 involves a charge that the accountants 'failed to disclose that [the firm] was insolvent' and that the financial

statements were 'false and misleading'. The federal Securities and Exchange Commission had 'forced the company' to restate its results, in 1970, from a net income of \$1,600,000 to a loss of \$3,966,000.²⁶ The management and the stockbrokers are defendants in the suit as well as the accountants.

An even larger suit is that involving questionable human judgment in the evaluation of inventory. It is for \$35,000,000 damages. The plaintiff claims that 21 of the company officers, and the accounting firm '... artificially raised the ... company's net worth "by more than \$35,000,000".' The charge is that by using 'improper accounting methods regarding its inventories', the company produced 'false and misleading' statements and induced employees to buy stock. The suit alleges that the net result was to 'artificially boost the stock and inflate the net worth of the company'.²⁷

On the position statement (balance sheet) of a private business the four following valuation processes are mentioned as examples.

First, accounts receivable – less allowance for doubtful accounts.

The accounts are quite well known and verified to some degree, by the audit or attest process, but the decision to write off an account as worthless is a human decision as to its lack of value. Moreover the decision as to the amount to be calculated for the allowance for doubtful accounts is a matter of judgment. This amount is determined by past history, the current phase of the general business cycle and the prospects for collections in the future.

Second, inventories.

There are certain quantities actually counted or at least counted on a sampling basis, and there may be an *entry* price, or the price actually paid for a specific item, but both these items are subject to scrutiny. As to quantity it may be decided that there are more than can be sold in a reasonable time, so one writes off the quantity, which reduces the ultimate value. As to price, the figure used should not exceed the *exit* price or the price at which the item can be disposed of. Even the so-called conservative approach of 'cost or market whichever is lower' assumes that the 'market' is known. This is always a prognostication as the only time a firm sells anything is in the future! Thus detailed written procedures will be of very little assistance in the matter of inventories, as each case must be decided on its merits.²⁸

²⁶ *Los Angeles Times*, September 25, 1972, Part III, page 14, '1st Fidelity Misled Investors, Suits by Shareholders Say.'

²⁷ *Wall Street Journal*, October 6, 1972, page 24, 'Genesco to Contest Suit Over Net Worth Report.'

Third, long-life assets (tangible).

These are often called 'fixed', which is quite misleading as they start to wear out as soon as installed. Judgment is required first in the calculation of the cost of the asset. For example, how much overhead should be charged to the machine when it was built? The decline in value, for statement purposes, is the result of judgment as it is necessary to decide the salvage value or final residual value, the probable length of life and the method of depreciation to be employed. The only real value of a long life tangible asset is the present value of its future output or the amount that it will contribute to the income of the organisation. This amount may be more or less than its present depreciated 'book' value.

Fourth, long-life assets (intangible).

Patents, copyrights, franchises and leaseholds come under this category. The two main decisions to be made are, first, at the time the cost is incurred the decision must be made whether the cost should be capitalised or expensed. If capitalised then the second decision involves the rate and the method of amortisation.

These examples of decisions, which must be made by the accountant, some by the internal or management accountant, and some by the external auditor, demonstrate the need for the development of the fundamentals, which should help in making the necessary choices.

Fundamentals

Earlier a list of 15 possible 'essential elements' of the fundamentals was presented. Several of these have to do with the quantitative data to be shown in financial statements and to the qualitative information which may be in the explanatory part of the report of the organisation. In a sense some of these elements relate to the underlying conditions in the economic world and although the accountant must be cognisant of them they are not subject to his judgment. The elements, relating to data, comprising the underlying economic system, seem to be the following:

- appropriateness
- continuity
- freedom from bias
- objectivity
- quantifiability
- relevancy
- uniformity
- verifiability

(Several of these elements may be mentioned in connection with the development of fundamentals,

but are not in themselves of the same nature as fundamentals.)

Conservatism

Conservatism is well-defined, the idea of using the lowest of several possible values for assets and revenues, and the highest of several possible values for liabilities and expenses.²⁹ Even though conservatism has been mentioned as an essential by certain writers, it seems that it should be eliminated, as it would not lead to an adequate presentation of financial data. Continuity seems to have played an exaggerated role in the past. It seems obvious that if a firm is about to liquidate then the asset values are different than if it is assumed to be continuing as a going concern. Therefore this essential is related to the assumptions necessary for statement preparation.

This leaves the remaining elements to be developed into fundamentals:

- comparability
- consistency
- determination of income
- disclosure
- materiality

The fundamentals should be universal and thus they would apply to all sorts of financial statements, but each statement will be based on certain assumptions, depending on the legal entity involved, the period of time employed, and the valuation basis to be employed, all of which must be disclosed.

The future development of the fundamentals, on a world-wide basis, is obligatory for the profession for two main reasons. First, is the fact that the element of human judgment has been with us since the first days of estimating the value of wealth to be taxed in Babylon, thousands of years ago, and second, the pragmatic fact that reliance on the present accumulation of 'principles' has not worked. Accountants have been told 'no', in no uncertain terms by the courts of the land in a long series of cases. Among the rules that have not worked is the insistence on the standard opinion, in the auditor's report letter, which includes the words 'in conformity with the "generally accepted accounting principles"' without making any mention of which specific procedures were followed, nor the degree to which disclosure is involved.³⁰

Disclosure

As the main reason for the existence of the accounting system is to show achievement toward a goal, it is very important that sufficient information be disclosed. However, the volume of detailed data available makes it necessary for the preparer to

²⁸ See also the author's book entitled *Accounting for Management Decisions*, Intext, 1969, for a discussion of the results of using different methods of inventory valuation and other economic matters related to accounting.

²⁹ Eldon S. Hendriksen, *Accounting Theory* (Homewood, Illinois, Richard D. Irwin, Inc., 1970), p. 118.

summarise the numerical data into major categories and also to abbreviate the non-numerical portions of the reports.

In the financial reports of a legal entity this problem of summarising is first encountered when the system is designed. At that time, the detailed accounts and the summary accounts must be designated. The very names of the accounts are also important as they can be either understood or mis-understood by the reader of the report. The organisation of the financial report is also important. For example, an income statement for a mercantile firm can show the 'cost of goods sold' and therefore the gross income or markup can be computed or this cost can be combined with 'administrative and other expenses' so that markup or gross income percentage is not shown nor can it be computed. Another example, this time in the local government field, is the omission of long-life assets such as fire trucks and also omission of evidence of depreciation, so that the reader has no idea of the state of economic decline, of these assets, prior to the probable date of replacement. This need for replacement will disrupt the cash flow when new ones need to be purchased. A third example could be from the not-for-profit segment where, because the entity is not subject to income taxes, administrators are very careless about expensing such items as three-year insurance policies in one year or expensing the entire cost of long-life assets because depreciation, for tax purposes, is not involved. Thus the erroneous statements of the present financial condition really reflect future conditions. However, some efforts have been made to use accounting techniques in measuring effectiveness of not-for-profit-organisations.³¹

³⁰ The latest proposed edition of the auditors' opinion, to be required for audits performed by licensees in California, now includes the requirement of a third statement entitled 'Changes in Financial Position.' (California State Board of Accountancy, Title 16, Chapter 1, Art 9, Par. 58.1). This is being changed to follow Opinion 19 which the Accounting Principles Board of the AICPA has adopted.

'We have examined the balance sheet of X Company as of December 31, 19— and the related statements of income and retained earnings and changes in financial position for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the aforementioned financial statements present fairly the financial position of X Company at December 31, 19— and the results of its operations and the changes in its financial position for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.'

³¹ Emerson O. Henke, 'Performance Evaluation for Not-for-Profit Organizations,' (*The Journal of Accountancy*, June 1972), p. 51.

The arrangement of data can influence the reader because many people only peruse the statements and do not stop to make an analysis. A financial analyst would study them more carefully and probably look for more data.

In large scale entities the use of average and relative data is important because of the volume of information available. Investors wish to know the income per share, which is an average, and also the amount of this average for each of several previous periods of time, perhaps a forecast for the future and a comparison with other companies. Government administrators need to know the results of the activities under their direction but amounts of hours or dollars expended may be no indication of the effectiveness of the efforts. Measures of effectiveness are needed and very few have been developed. The cost of the fire department in a city is no measure of its effectiveness nor are the miles run by the trucks. In fact, the *absence* of fires and thus an *absence* of fire fighting activity would be 100% achievement of the goal. When these measures are available and disclosed they should supplement the present reports prepared by government officials.³²

The element of disclosure can be improved in many government reports as they often present a series of financial results of individual funds and do not show clearly an overall picture. The central government of the United States makes no attempt to disclose clearly all of its obligations, either short-term or long-term, nor does it disclose all of its assets. The government releases regularly certain specific items such as cash on hand and the amount of the national debt, but makes no systematic attempt at a position statement nor does it disclose the total cost of future obligations for such items as social security and veterans care. Furthermore the central government does a poor job of disclosing the cost of projects which will take more than one year to complete. The appropriations were made by the Congress and the systematic recording is done by no one at present.

In certain states municipal governments have improved their disclosure since audited statements have been required, but in the United States the counties, states and cities are quite backward in systematic disclosures of assets and liabilities. The existence of special or designated funds in 'fund' accounting complicates the problem but does not make it impossible.

³² The role that accounting could play in the 'discipline of public administration' is discussed in the article by Lennis M. Knighton entitled 'Accounting for Public Administration,' (*Journal of Contemporary Business*, Winter 1972), p. 11.

One element, not to be forgotten, is that in a competitive private property economy it is possible to insist on *too much* disclosure. Some data produced for internal reporting need not be used for external reporting, as there can be sufficient disclosure for outside purposes without giving away the internal secrets.

Certain government controls include the requirement of disclosure of financial information to the government officials that is deemed to be confidential and not to be disclosed to other persons. Other controls require disclosure of data that are deemed not to be confidential and are available at certain restricted places. The income tax data would be an example of the first category and a Securities Exchange Commission registration statement an example of the second.

In the case of the income tax returns the fundamental of disclosure becomes very important as, at present, the determination of income for financial statement purposes can be significantly different from that calculated for tax purposes as the income tax rules permit different procedures. When a figure in excess of \$689,000,000 shows on a financial statement as 'deferred income tax' then a considerable *disclosure* of methods employed is required, and this is often not presented for the reader of the statements.³³

The public utility segment of the business economy is subject to regulations due to the granting to it of monopoly rights by the citizens. This gives rise to a problem of disclosing enough information so that the regulators can do a good job and so that the citizens and legislators can see that they did a good job.

The State of California has expressed the right of the citizen to know, by the following:

'The people of this state do not yield their sovereignty to the agencies which serve them. The people, in delegating authority, do not give their public servants the right to decide what is good for the people to know and what is not good for them to know. The people insist on remaining informed so they may retain control over the instruments they have created.'³⁴

All the fundamentals may be involved in this problem because at present we have a seeming conflict between the rules laid down by the federal and state regulators and what are said to be 'generally accepted accounting principles'. In other words the auditor feels required to *disclose* that the income reported for regulatory purposes is different than it

would be for accounting purposes on a 'conventional basis'. In the case of publicly regulated utilities there is often a third set of income data which is prepared in accordance with the income tax rules.

In the United States the problem of disclosure is being investigated by the Accounting Objectives Study Group of the AICPA. Many persons have submitted testimony for consideration by this group, known as the Trueblood Committee, named for its chairman Robert M. Trueblood of Touche Ross and Co. The following statement relates the problem of disclosure to the larger problems of accounting:

'What is full and fair disclosure – and for whom?

Trueblood says that his committee is discussing whether CPAs should furnish different statements to different users, disclose the impact of social costs and benefits in financial statements, or include forecasts and budgets in the basic financial report'.³⁵

Materiality

'Materiality', in the business segment, is closely related to disclosure. It has been said that an item should be regarded as material if there is a reason to believe that knowledge of it would influence the decisions of an informed investor.³⁶ A more general statement which would include *all* segments of the economy is '... information may be considered material and thus disclosure necessary, if the knowledge of this information may be significant to the users of accounting reports'.³⁷

Determination of Income

In the business segment especially, income determination is a very important fundamental, but this determination must depend on the judgment of the accountants, both internal and external, because the decision between 'capital' and 'income' must continually be made. It can be said generally that the idea of matching 'current revenue' with 'current expenses' is the essence of this determination, but the decision as to detail must be left to the individual accountant who should disclose his methods sufficiently, either in statements, the explanatory notes, or in the 'Audit Report Letter'. This letter is sometimes called a 'certificate'. This is a misnomer as auditors cannot certify, warrant or insure accuracy, as the term is known to laymen, because the reports are the result of judgment.

³⁵ Business Week, *op. cit.*, p. 57.

³⁶ American Accounting Association, Committee on Accounting Concepts and Standards, *Accounting and Reporting Standards for Corporate Financial Statements and Preceding Statements and Supplements* (Columbus, Ohio, AAA, 1957), p. 8.

³⁷ *Op. Cit.*, Hendriksen, p. 107.

³³ Sears, Roebuck and Co., Annual Report dated March 29, 1971 for the year ended January 31, 1971.

³⁴ Preamble of the Ralph M. Brown Act, 1953, Government Code of the State of California, sec. 54950.

Comparability and Consistency

Comparability and consistency are closely related. Comparability is meaningful when it is possible to compare results for the same entity from one time period to another. If this is to be done in a satisfactory manner then the systems used to prepare the data must be consistent in both time periods or the comparisons would be invalid. If the system is changed then the data for the earlier period must be adjusted and the fact of the change and its significance disclosed in an explanatory note.

Even if the procedures employed were common within an industry, or sub-segment of the economy, there would still be difficulties in comparison between industries. For example, a comparison of the reported financial results of the activities of Standard Oil of New Jersey and Sears Roebuck and Co. is complicated by the fact that the different nature of businesses means that different procedures are employed within each firm. Sears financial statements involve deferred income on billions of dollars of instalment payments, while the oil company does not rely on instalment financing. However, the oil company has problems involving percentage depletion deductions, not based on historical cost, while the merchandising company

is not involved with this problem. The investor may be interested only in the final average, or net income per share, but this figure alone does not tell him much about the procedures employed in the accounting system which produced these averages.

Therefore a summary of the procedures employed in arriving at the results should always be clearly stated, not just when required by law, nor just when there is a change in procedure.

Conclusion

If these 'fundamentals' are refined, debated, and accepted throughout the world there could be the beginning of a better reliance on the statements prepared by accountants and the public would be better served. A final quotation well summarises the situation as the exercise of judgment by professional accountants:

'... despite all of the detailed rules . . . the ultimate quality of the financial statements [and] the fairness of their presentation . . . turns on the competence and independence of the individual professional auditor'.³⁸

³⁸ *Op. Cit.*, Business Week, p. 60.

The effects of using current costs in the measurement of business income

James Benjamin

The issue of whether historic costs or current replacement costs should be used in the measurement of business income has received considerable attention in recent years. Although much discussion appears in the literature on the theoretical merits of using current costs in the measurement of business income, there have been few studies concerning the significance of alterations resulting from the use of current costs.

The allocation of investor capital depends upon the cumulative effect of investor decisions. The firm's results of operations, and particularly operating income, are generally considered to be among the primary quantifiable measures affecting these decisions. It would seem, therefore, that there is a need to indicate the effects on operating income caused by the use of current costs instead of historic costs. One way of obtaining such information is to make adjustments to the statements of actual companies. There have been at least two studies involving the application of the current cost model developed by Edwards and Bell¹ to a business firm. Peter Dickerson revised the data for a small manufacturing firm for the year 1962. He found that the use of current costs raised current operating income by slightly under 15 percent.² Raymond Dockweiler, in a case study of a manufacturing firm for the three year period of 1964-1966, found that operating income based on current costs was about 13 percent less than conventional historic cost operating income.³ The problem with using actual data is that the results are limited to the events which actually occurred. For

example, in considering the results of the case studies, the effects on operating income apply only to a firm with specific characteristics during a given time period.

Another means of providing data concerning the effects of measuring income on the basis of current costs is to use aggregate figures to show the effects on the incomes of all firms in the national economy. The problem with aggregate figures is that they may hide what might be very much larger percentage differences for individual firms. For a given change in asset prices, the difference between operating income measured in terms of current costs and conventional operating income may differ substantially among firms. The extent of the effect depends upon such factors as the importance of physical assets in the operation of the firm, the rate of turnover in physical assets, and the average age or year of acquisition of existing assets. The two principal types of physical assets for which current costs may differ substantially from historic costs are fixed assets and inventories.

The objective of this study is to indicate the effects on operating income resulting from the use of current costs to measure depreciation expense and the cost of materials used⁴ under different sets of assumed conditions. For the reasons stated in the preceding paragraphs, simulation was used as the basic tool of this research. A description of the simulation model is set forth in the following section.

Description of the Model

The simulation model is organized into three basic processes:

1. Generation of operating data for each day during

¹ Edgar O. Edwards and Phillip W. Bell, *The Theory and Measurement of Business Income* (Berkeley: University of California Press, 1961).

² Peter J. Dickerson, *Business Income - A Critical Analysis*, Institute of Business and Economic Research (Berkeley: University of California Press, 1965), p. 34.

³ Raymond C. Dockweiler, 'The Practicability of Developing Multiple Financial Statements: A Case Study,' *The Accounting Review* (October, 1969), p. 734.

⁴ The simulation considers only the materials component of the cost of goods sold for a manufacturer. The current cost of material used represents the current cost of the materials input of the final products sold. For a retailer or wholesaler, the current cost of materials used is equal to the current cost of goods sold.

the simulated time period. This includes the amounts of inventory purchases and sales, fixed asset purchases and actual lives, and the current purchase prices of the inventory item and the fixed assets.

2. Computation of accounting results based on the data produced by the first process. Data are accumulated for records maintained on a historic cost basis and records based on current costs. The results are summarized separately for the effects of recording fixed assets and the effects of recording inventories on the basis of current cost.
3. Exhibition of the results of the simulation for each year and for the total simulated time period. The output of the simulation consists of the percentage change in operating income resulting from the use of current costs to measure depreciation expense and the cost of materials used, given certain firm characteristics.

The effects on operating income resulting from the use of current costs were computed for selected combinations of assumed firm characteristics. The results are directly related to the assumptions built into the simulation model. These assumptions are:

1. The effects of recording current costs are measured for the 19 year period from 1952 through 1970. With respect to the fixed assets, data are generated from the date of origin of the firm through 1951. Since fixed assets are used over a period of several years, this provides historical data for a period of time long enough so that the full impact of the asset price changes can be measured. It is assumed that there are 240 business days in each year.
2. The company has four types of fixed assets and a single product. Each fixed asset group and the inventory item are assigned a base cost. Thereafter, the purchase price of each asset group changes on the basis of a specific price index. Subgroup indexes of the Wholesale Price Index are used in generating the prices of the inventory item and of fixed assets other than buildings. The Boeckh Indexes are the source of the price index for buildings.⁵ The asset groups are as follows:

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Asset Group Base Cost Specific Price Index

| | Base Cost | Specific Price Index |
|------------------------|-----------|----------------------------------|
| | \$ | |
| Trucks | 1,000 | Motor Vehicles |
| Furniture and Fixtures | 1,000 | Commercial Furniture |
| Machinery | 3,000 | General Purpose Machinery |
| Buildings | 10,000 | Commercial and Factory Buildings |
| Inventory Item | 10 | Producer Finished Goods |

The indexes used for trucks, furniture and fixtures, and machinery increased at annual rates of 3 to 3½ percent over the simulation period. The buildings index increased at an annual rate of almost 5 percent, while the index used for the inventory item increased at approximately 2½ percent annually. The particular indexes used were selected as an example of possible price movements in the United States during the period covered.

3. A simulation experiment is run for each combination of assumed firm characteristics. With respect to fixed assets, the variables include the year of origin of the firm, the growth rate in fixed assets, the proportion of long-lived assets (expected life in excess of 12 years), and the ratio of depreciation expense to operating income. In different runs of the simulation these variables were assigned the following hypothetical values: (A) Year of Origin: 1935, 1945, 1955 or 1965 (B) Proportion of Long-Lived Assets: .25 or .75 (C) Annual Growth Rate: 0, 2½, or 5% (D) Ratio of Depreciation Expense to Operating Income: .1 or .4

With respect to the inventory item, the variable factors included the turnover rate and the ratio of the cost of materials used to operating income. In different runs, the turnover rate was set at 1, 3, 6 and 9 times per year and the ratio of cost of materials used to operating income was either 1:1, 3:1 or 10:1.

4. Current cost data are computed in accordance with the techniques developed by Edwards and Bell.
5. The acquisition and retirement of individual fixed asset units are assumed to occur at the beginning of the month. The actual life of each fixed asset unit is generated from a normal probability distribution. The expected value and standard deviation of the lives for the assets in each group are as follows:

⁵ The indexes other than Buildings were obtained from the Bureau of Labor Statistics, *The Monthly Labor Review*, in issues from July, 1952, to March, 1971. The Boeckh index for Commercial and Factory Buildings was obtained from the U.S. Department of Commerce, *The Construction Review*, September, 1971, pp. 39-40, and September, 1964, p. 41.

| <i>Asset Group</i> | <i>Expected Life (Months)</i> | <i>Standard Deviation (Months)</i> |
|------------------------|-------------------------------|------------------------------------|
| Trucks | 72 | 6 |
| Furniture and Fixtures | 120 | 10 |
| Machinery | 144 | 12 |
| Buildings | 540 | 12 |

6. The fixed assets are depreciated over the expected life of assets in their group using the straight-line unit method. If an asset is retired before it is fully depreciated, the asset account is reduced by the original cost and the accumulated depreciation account is relieved of the applicable amount of recorded depreciation. Salvage value is zero, and there is no gain or loss on retirement.

7. The expected value of the average inventory level is 2,000 units, and there are ten inventory purchases per year. At the beginning of each run, the expected values of sales per day and purchase quantities per order are computed on the basis of the turnover variable and the average inventory level. Actual sales and purchase quantities are generated from a normal distribution. The first-in, first-out method is used as the basis of allocating cost between inventory and the cost of materials used in the historical cost framework.

The model is designed so that the differences between conventional operating income and operating income adjusted for the current costs of using fixed assets are separated from the differences between conventional operating and operating income based on adjusting inventory values and the cost of material used to current costs. This separation allows an analysis of the relationships between certain firm characteristics related to either fixed assets or inventories and the effects on operating income of using current costs.

Fixed Assets and Depreciation Expense

The effect of the current cost/historic cost differential of depreciation expense on operating income is dependent upon the historical movement of prices since the earliest date of acquisition of existing fixed assets. For given changes in asset prices, the effect for a particular firm depends upon the following characteristics which may differ among firms.

1. *Growth Rate*: There is an inverse relationship between the growth rate of the firm's fixed assets and the effect on operating income of measuring depreciation expense on the basis of current

costs. This occurs because the fixed assets of a faster growing firm is newer, on the average, than the assets of a firm with a slower growth rate. Since the historic cost of the assets in a faster growing firm are based on more recent prices, there is less difference between current and historic cost depreciation expense. This inverse relationship can be seen by reading across any of the rows in Table 1. It is apparent from the difference in the size of the effects, particularly for firms originating in 1935 or 1945, that the rate of growth can be a factor of some importance.

2. *Average Life Assets*: There is a direct relationship between the average life of the firm's fixed assets and the effect on operating income from the difference between current cost and historic cost depreciation expense. This can be seen by comparing the left side of Table 1 (predominance of long-lived assets) with the right side of Table 1 (predominance of short-lived assets). In a period of rising prices, a firm with long-lived assets experiences a larger reduction in operating income than a firm with short-lived assets because the original costs of the long-lived assets were, on the average, determined at earlier dates than the original costs of short-lived assets. Therefore, there is a larger difference between the current costs and historic costs of the long-lived assets, and, in turn, a larger difference between current cost and historic cost depreciation expense.

3. *Date of Origin*: The date of origin affects the current cost/historic cost differential on depreciation expense through its effect on the average age of a firm's assets. This occurs because the original assets of a newer firm are more recently dated than the original assets of an older firm. Consequently, the firm with the oldest assets, on the average, will be most affected by the cumulative change in asset prices.

The impact of a given change in fixed asset prices may differ substantially among firms originating in different years. This can be seen by reading down any of the columns in Table 1.

4. *Ratio of Depreciation Expense to Operating Income*: There is a direct linear relationship between the effect on operating income of measuring depreciation expense on the basis of current costs and the size of depreciation expense relative to operating income.

TABLE 1
Percent Effect on Operating Income from using Current Costs
rather than Historic Costs to measure Depreciation Expense

| Year of Origin | Average Effect ¹ | | | Predominance of Short-lived Assets | | |
|-------------------|--|-------|-------|---------------------------------------|-------|------|
| | Predominance of Long-lived Assets | | | Growth Rate | | |
| | 0% | 2½% | 5% | 0% | 2½% | 5% |
| | 4:10 Ratio of Depreciation Expense to Operating Income | | | | | |
| 1935 | -37.8 | -23.1 | -18.2 | -11.1 | -9.6 | -8.0 |
| 1945 | -25.2 | -17.3 | -14.9 | -9.7 | -8.5 | -7.6 |
| 1955 | -9.5 | -8.0 | -7.4 | -6.4 | -5.8 | -5.3 |
| 1965 | -5.8 | -5.4 | -5.3 | -3.8 | -3.6 | -3.5 |
| | 1:10 Ratio of Depreciation Expense to Operating Income | | | | | |
| 1935 | -9.4 | -5.8 | -4.5 | -2.8 | -2.4 | -2.0 |
| 1945 | -6.3 | -4.3 | -3.7 | -2.4 | -2.1 | -1.9 |
| 1955 | -2.4 | -2.0 | -1.9 | -1.6 | -1.4 | -1.3 |
| 1965 | -1.5 | -1.4 | -1.3 | -1.0 | -0.9 | -0.9 |
| Year of Origin | Maximum Effect ² | | | Predominance of Short-lived Assets | | |
| | Predominance of Long-lived Assets | | | Growth Rate | | |
| | 0% | 2½% | 5% | 0% | 2½% | 5% |
| | 4:10 Ratio of Depreciation Expense to Operating Income | | | | | |
| 1935 | -53.6 | -28.8 | -21.9 | -13.0 | -11.2 | -9.3 |
| 1945 | -38.3 | -24.6 | -19.6 | -10.4 | -9.7 | -8.4 |
| 1955 | -20.5 | -16.4 | -14.9 | -9.0 | -9.0 | -8.0 |
| 1965 | -12.4 | -11.3 | -10.9 | -8.4 | -7.9 | -7.5 |
| | 1:10 Ratio of Depreciation Expense to Operating Income | | | | | |
| 1935 | -13.4 | -7.2 | -5.5 | -3.2 | -2.8 | -2.3 |
| 1945 | -9.6 | -6.2 | -4.9 | -2.6 | -2.4 | -2.1 |
| 1955 | -5.1 | -4.1 | -3.7 | -2.2 | -2.2 | -2.0 |
| 1965 | -3.1 | -2.8 | -2.7 | -2.1 | -2.0 | -1.9 |

¹Mean effect on operating income for the 19 year simulation period.

²Maximum effect for any one year during the simulation period.

Two points are apparent from these results: (1) The effect of recording fixed assets in terms of current costs may differ substantially among firms. For the given change in fixed asset prices, the effect on the operating income for firms represented by the combinations of characteristics in Table 1 could have been reduced, on the average, by as much as 37 percent or as little as one percent. (2) Even though depreciation typically represents only a relatively small proportion of the total expenses of a firm, measuring depreciation in terms of current costs during periods of only moderate price increases may produce substantial reductions in operating income. This can occur for two reasons. First, depreciation expense may be a material item in relation to operating income. Second, depreciation expense is often related to fixed assets purchased many years prior to the current date. Therefore, the effect on operating income depends upon the cumulative change in asset prices since the date of asset acquisitions.

Cost of Materials Used

The difference between the current cost and the historic cost of materials used is affected primarily by current price changes. For a given price change,

the magnitude of the effect for any one firm depends upon the timing and magnitude of the inventory flows.

1. *Turnover Rate*: There is an inverse relationship between the turnover rate of the inventory item and the effect on operating income of measuring the cost of materials used on the basis of current costs. The faster the turnover rate, the shorter is the time between the acquisition and sale of the inventory item. Thus, the historic cost of material used in a firm with a higher turnover rate is based on more recent prices so that there is a smaller difference between the current and original cost. This relationship can be seen by reading across any of the rows in Table 2.

2. *Ratio of Cost of Materials Used to Operating Income*: Each of the columns in Table 2 illustrates that there is a direct linear relationship between the effect on operating income of adjusting material usage to current costs and the magnitude of the cost of materials used relative to operating income.

TABLE 2
Percent Effect on Operating Income from using Current Costs
rather than Historic Costs to measure the Cost of Materials Used.

*Ratio of CMU to
Operating Income*

| | 1 | 3 | 6 | 9 |
|------|-------|-----------------------|------|------|
| | | <i>Turnover Rate</i> | | |
| | | <i>Average Effect</i> | | |
| 1:1 | - 2.4 | - 0.8 | -0.4 | -0.3 |
| 3:1 | - 7.2 | - 2.4 | -1.2 | -0.8 |
| 10:1 | -24.0 | - 8.1 | -4.1 | -2.7 |
| | | <i>Maximum Effect</i> | | |
| 1:1 | - 4.6 | - 1.5 | -0.8 | -0.5 |
| 3:1 | -13.8 | - 4.6 | -2.3 | -1.6 |
| 10:1 | -46.1 | -15.4 | -7.2 | -5.2 |

The results indicate that measuring the cost of materials used in terms of current costs can have a substantial impact on operating income. Furthermore, the size of the effects also differs considerably among firms with different characteristics.

Summary and Conclusions

The results of this study have indicated that the effects on operating income of measuring depreciation expense and the cost of materials used on the basis of current costs may be substantial for some firms but insignificant for others. For the 19 year period in this study, the reduction in operating income created by the increasing prices of either the fixed assets or the inventory item was negligible for some types of firms but as high as 50 percent for others. Obviously, measuring depreciation expense and the cost of materials used in terms of current costs does not have a consistent effect on the operating income of different firms.

If inventories are significant and fixed assets immaterial, the difference between conventional operating income and operating income based on current

costs is dependent primarily upon current price changes. For a particular firm this difference also depends upon the magnitude and timing of the inventory flows. If fixed assets are important, the difference between conventional and adjusted operating income is contingent upon cumulative past price trends. For any one firm, the magnitude of the effect on operating income depends upon the average life of the assets, the growth rate, and the age of the firm.

There is very little information about how the decision making of external users would be affected by the presentation of financial statements based on current costs. However, it appears that the magnitude of the difference between current cost and historic cost financial statements may be significant. Moreover, firms would be affected to varying degrees, depending upon such factors as capital intensity, inventory turnover, etc. Consequently, if the investor is unable to judge the magnitude of those changes, it would seem that the presentation of financial statements based on current costs are necessary for sound investor decision making.

The incremental costing of university expansion

Michael Pickford

1. Introduction

The Report has recently been published of a research project undertaken at the University of Bradford which was financed jointly by the U.K.'s Department of Education and Science and by OECD's Centre for Education Research and Innovation (CERI).¹

The main purpose of the project was to investigate potential economies in the cost of 'producing' students, with special reference to Bradford University. One of the most significant findings is that it is easier to gain such economies through an expansion of student numbers, more fully using existing facilities, than by attempting to cut costs while keeping student numbers constant. Although the cost of the university increases in total, the cost per student declines.

The large expansion of student numbers forecast for U.K. Universities over the next decade gives scope for the utilisation of such economies. Hence one part of the Report concerns the planning for expansion within the University of Bradford, especially with a view to costing, and to seeking economies in, the expansion proposals made by the various schools for the forthcoming quinquennium (1972/3-1976/7). The purpose of this paper is to outline the method adopted for producing the incremental (marginal) cost per student of such proposals, and then to discuss the results obtained.²

2. Incremental costing

The starting point of the work was the study by Khanna and Bottomley³ of the cost of 'producing'

first degree graduates at the University of Bradford. In this study, rents were imputed to the university's capital resources of buildings, land, furniture and equipment, and these were added to the university's annual expenditure of recurrent grant on staff and materials. Then the resources, or proportions of resources, used for teaching undergraduates were extracted from the total and costed to the appropriate course. The final result was the cost per student-year of students in various schools, such as Civil Engineering, Applied Physics, Pharmacy, and Social Sciences, disaggregated into (a) capital and maintenance costs, (b) teaching costs, (c) administrative expenditures, (d) library expenditure, and (e) student facility expenditure. The study thus provides a picture of the average cost of undergraduate students in various courses at the University of Bradford at a particular point in time. These form the 'base line' from which the expansion into the future of student numbers in the various courses is costed.⁴

As a result of the output-budgeting requirement that all of the university's resources should be attributed to one output or another, the total cost of a school is inflated by the inclusion of important resources, such as rooms and equipment, which are currently under-utilised. For this reason, it is possible to expand student numbers with less than *pro rata* increases in expenditure on these items; the additional cost incurred per additional student, the so-called 'incremental' (marginal) cost per student, will be lower than the present average cost per student. Following the normal relationship between average and incremental (marginal) functions, the average cost per student will decline with the expansion of student numbers as the 'cheaper' incremental numbers are included in the total.

¹University of Bradford: *Costs and Potential Economies*, CERI Programme on Institutional Management in Higher Education, (Paris: OECD, March 1972).

²*Ibid.*, chapters 13 and 14. Two other expansion proposals have been costed since the Report was completed, and the results of these are included here.

³R. K. Khanna and (J.) A. Bottomley: 'Costs and Returns on Graduates of the University of Bradford', *Accounting and Business Research*, No. 1, (Winter, 1970), pp. 56-70.

⁴The figures in the published study, which related to 1966/67, were subsequently updated to 1969/70 by R. K. Khanna. These later figures are published in *Costs and Potential Economies*, *op. cit.*, Appendix 1, and form the starting point of the incremental costing exercise.

The additional cost per additional student is referred to as the 'incremental cost' per student, in preference to the term 'marginal cost'. Marginal cost is defined as the increase in total cost resulting from an increase in output of one unit, or in this case, an increase of one student. The course expansions envisage increases in student numbers in annual steps of up to twenty or more, amounts which are not marginal but incremental. Hence the term 'incremental cost per student' is the more appropriate.

The incremental costing exercise was based upon data collected from the schools. Once the expansion of student numbers in a particular course had been provisionally decided by the University's Academic Planning Committee, a meeting was arranged with the Professor concerned, or his nominee. At this meeting the Professor was asked what additional resources he would require, and could reasonably expect to obtain, in order to cope with the proposed expansion. Most Professors responded with surprising enthusiasm, although they qualified the information given as tentative - 'at best an inspired guess!' said one. The information was filled into a questionnaire to facilitate a consistent approach to the enquiry, and was later costed out using average gross salaries for staff, purchase prices for materials, and imputed rents for rooms and equipment.⁵

A problem with new units of resources required by an expansion proposal is that for part of the time they may be employed upon work not connected with the proposal in question. The most obvious example concerns academic staff, for although the justification for their original employment may be to share the additional workload of an expanded undergraduate course, they are expected to do some personal research, and may also teach on postgraduate or other undergraduate courses. In the results presented here, therefore, only that proportion of a resource which it is estimated will be devoted to the proposal in question has been included in the costs, the balancing proportion being ignored⁶. In the case of academic staff, the distribution of time between activities found in an internal survey in 1967/68 is used.⁷ With other resources Professors were invited to make estimates, but in most cases (with the exception of

staff offices, which were apportioned on the same basis as the staff members who are to use them) it was assumed that the resource would be fully employed on the course.

3. A costing example

The costing of the Applied Biology course will serve to illustrate the approach and the detailed results obtained. The main results for the other courses can then be introduced.

The Undergraduate School of Applied Biology is a well-established school at Bradford with a first year intake of 33 students in 1970/71. It is proposed to increase the intake to 60 by 1976/77 which, allowing for a slight wastage rate, will lead to an increase in total student numbers from 112 to 194. Using the estimates obtained from the School on the additional resources required to cope with this expansion, Table 1 indicates how the costs of the course should change through the quinquennium.

The 1969/70 column of Table 1 gives the cost of that course, item by item, in the 'base' year. The total cost amounts to £79,452 (row A). The following columns from 1970/71 to 1976/77 show the increases in total cost, item by item, as the new resources are brought into use. Thus, academic staff salaries (row 2a) show a considerable increase over the period owing to the employment of eight additional staff members, and this in turn is reflected in a demand for more academic staff offices (row 1c.). Three new teaching laboratories will also be required (row 1b.), which is matched by a proportional expansion in the cost of technical staff (row 2b.).

It should be noted, however, that because the exercise started late in 1970/71, it was not practical to cost the additional resources obtained in that year, and so it was optimistically assumed that all costs remained constant during 1970/71 despite the expansion in student numbers. Similarly, all central expenses (*i.e.* items 3a, 4 and 5) are assumed to remain constant during the expansion of the course on the assumption that the extra student numbers involved are too small to incur any additional expenses in those items.

Overall, Table 1 indicates that the total cost of the course should increase from £79,452 in 1969/70 to

⁵The costs of these resources should represent their 'social opportunity cost', *i.e.* the worth of the output forgone by 'the nation' in having the resources employed in the university rather than outside, say in industry. It is also possible to 'cost' the resources in financial terms, *i.e.* in terms of the actual financial outlays on their employment by the university. In this case, the social opportunity cost rents for buildings and equipment would be replaced by their initial purchase price (see *Costs and Potential Economies*, *op. cit.*, chapter 1). Social opportunity costs should, however, provide a more appropriate guide to national policy.

⁶This apportionment produces the so-called 'part-cost' of the proposal. It is also possible to produce the 'full-cost' by attributing the entire cost of each additional resource to the proposal, on the grounds that without the expansion these resources would not have been employed at all. The 'full-cost' of proposals is included in *Costs and Potential Economies*, *op. cit.*, chapters 13 and 14.

⁷R. K. Khanna and M. Shattock: 'Analysis of University Staff Time', unpublished paper (University of Bradford, 1968).

TABLE 1
Applied Biology: Course Costs 1969/70 to 1976/77

| Item of Expenditure | 1969/70 | 1970/71 | 1971/72 | 1972/73 | 1973/74 | 1974/75 | 1975/76 | 1976/77 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. Capital and Maintenance Costs | £ | £ | £ | £ | £ | £ | £ | £ |
| a. Classrooms | 2,009 | 2,009 | 2,009 | 3,089 | 3,089 | 3,089 | 3,089 | 3,089 |
| b. Teaching Laboratories | 8,701 | 8,701 | 8,701 | 13,885 | 13,885 | 13,885 | 15,726 | 15,726 |
| c. Academic Staff Offices | 1,463 | 1,463 | 1,526 | 1,526 | 1,654 | 1,890 | 2,018 | 2,210 |
| d. Administrative Staff Offices | 412 | 412 | 412 | 412 | 412 | 524 | 524 | 524 |
| e. Study Facility Space | 1,232 | 1,232 | 1,232 | 1,232 | 1,232 | 1,232 | 1,232 | 1,232 |
| f. Student Facility Space | 7,392 | 7,392 | 7,392 | 7,392 | 7,392 | 7,392 | 7,392 | 7,392 |
| g. Staff Facility Space | 618 | 618 | 618 | 618 | 618 | 618 | 618 | 618 |
| SUB-TOTAL | 21,827 | 21,827 | 21,890 | 28,154 | 28,282 | 28,630 | 30,599 | 30,791 |
| 2. Teaching Costs | | | | | | | | |
| a. Academic Staff Salaries | 23,839 | 23,839 | 25,037 | 26,707 | 28,302 | 31,951 | 33,547 | 36,340 |
| b. Technical Staff Salaries | 8,701 | 8,701 | 10,333 | 11,804 | 12,873 | 12,873 | 14,217 | 16,067 |
| c. Expenditure on Teaching Equipment and Materials | 9,086 | 9,086 | 11,561 | 12,438 | 12,870 | 13,357 | 13,899 | 14,496 |
| SUB-TOTAL | 41,626 | 41,626 | 46,931 | 50,949 | 54,045 | 58,181 | 61,663 | 66,903 |
| 3. Administrative Expenditures | | | | | | | | |
| a. Central University Expenditures | 8,961 | 8,961 | 8,961 | 8,961 | 8,961 | 8,961 | 8,961 | 8,961 |
| b. School Expenditure | 1,648 | 1,648 | 1,648 | 1,648 | 1,648 | 2,442 | 2,442 | 2,442 |
| SUB-TOTAL | 10,609 | 10,609 | 10,609 | 10,609 | 10,609 | 11,403 | 11,403 | 11,403 |
| 4. Library Expenditures | 2,387 | 2,387 | 2,387 | 2,387 | 2,387 | 2,387 | 2,387 | 2,387 |
| 5. General Expenditures | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 |
| A. TOTAL COST | 79,452 | 79,452 | 84,820 | 95,102 | 98,326 | 103,604 | 109,055 | 114,487 |
| B. Total Student Numbers | 103 | 112 | 126 | 138 | 152 | 164 | 174 | 194 |
| C. Average Cost per Student-Year (i.e. A ÷ B) | 771 | 709 | 673 | 689 | 647 | 632 | 627 | 590 |
| D. TOTAL INCREMENTAL COST | 0 | 0 | 5,368 | 10,282 | 13,506 | 5,278 | 5,451 | 5,432 |
| E. Incremental Student Numbers | 0 | 9 | 14 | 12 | 14 | 12 | 10 | 20 |
| F. Incremental Cost per Student-Year (i.e. D ÷ E) | 0 | 0 | 383 | 855 | 229 | 439 | 544 | 270 |

£114,487 in 1976/77 (assuming constant prices). These totals can be divided by the total student numbers in the same years (row B) to produce the average cost per student-year (row C). On the other hand, the incremental cost per student-year (row F) is calculated by dividing the total incremental cost (row D), which measures the increase in total cost in any one year over the previous year, by the incremental student numbers (row E), which similarly indicates the increase in total student numbers in one year over the previous year. The incremental cost thus shows the additional cost per additional student-year.

The average and incremental cost curves calculated in Table 1 for the expansion of the Applied Biology course are plotted in Figure 1. The average cost per student-year gradually declines over the period, falling from £771 in 1969/70 to £590 in 1976/77.

This downward trend arises from the fact that the incremental cost curve, which shows the cost per student-year of additional students, generally lies below it. Hence, as each annual increment of cheaper additional students is added to the running total, the recalculated average cost must fall. The sharply uneven nature of the incremental cost curve is due to the intake of new resources failing to coincide exactly with the intake of additional students, but taking the period as a whole, the incremental cost per student-year averages £385.

Table 2 summarises the main changes in the cost of the Applied Biology course as presented in Table 1. Teaching costs show the biggest increase over the period between 1969/70 and 1976/77, with capital and maintenance costs also undergoing a substantial expansion. Overall, an 88 percent increase in student

FIGURE 1: APPLIED BIOLOGY—Average and Incremental Cost Per Student-Year, 1969/70—1976/77

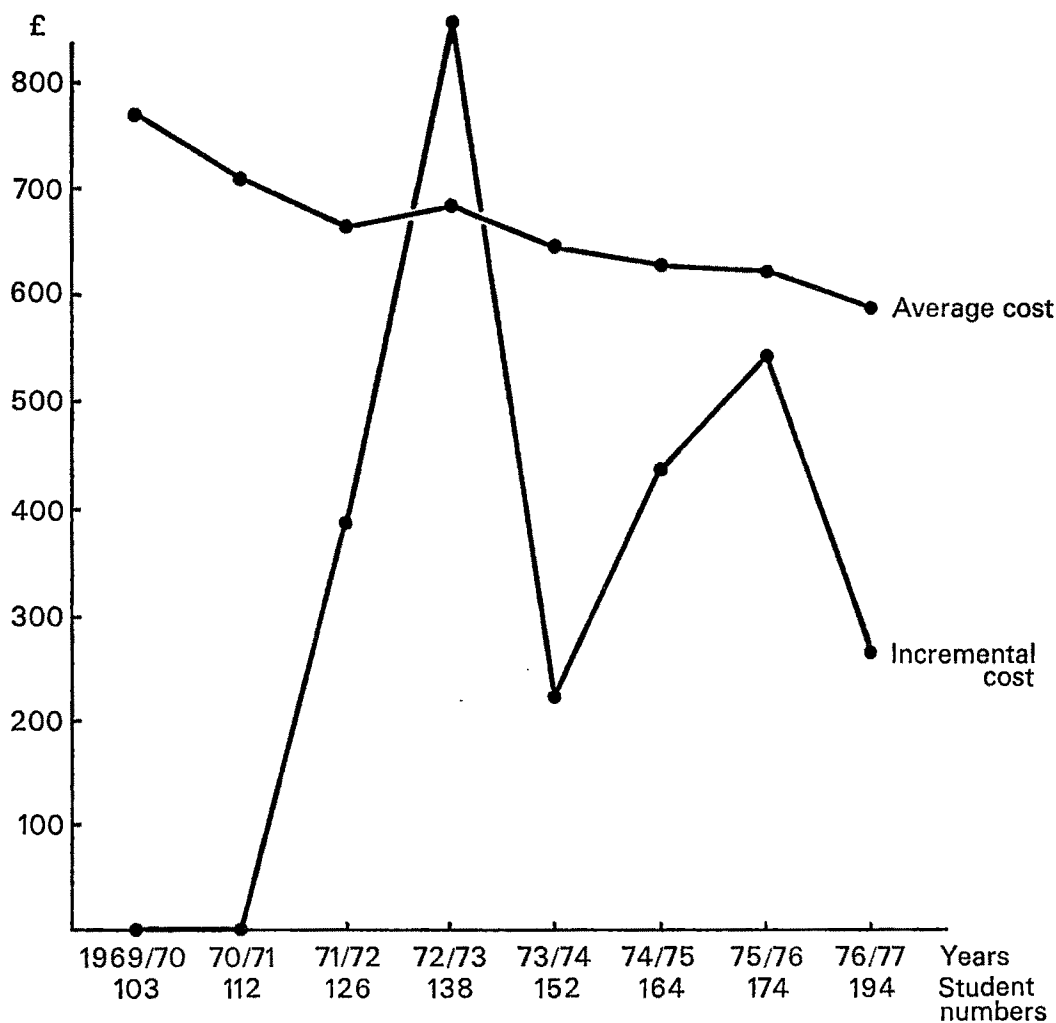


TABLE 2: Applied Biology – Summary of Changes in the Cost of the Course with Expansion over the years between 1969/70 and 1976/77

| Items of Expenditure | TOTAL COST | | Percentage Change between (1) and (2) (3) |
|---|----------------|----------------|---|
| | 1969/70 (1) | 1976/77 (2) | |
| 1. Capital and Maintenance Costs | £21,827 | £30,791 | 41 |
| 2. Teaching Costs | 41,626 | 66,903 | 61 |
| 3. Administrative Expenditure | 10,609 | 11,403 | 8 |
| 4. Library Expenditure | 2,387 | 2,387 | 0 |
| 5. General Expenditures | 3,003 | 3,003 | 0 |
| A. Total Cost | £79,452 | £114,487 | 44 |
| B. Total Student Numbers | 103 | 194 | 88 |
| C. Average Cost per Student-Year (i.e. A ÷ B) | £771 | £590 | -23 |
| D. Total Incremental Cost | — | £35,035 | — |
| E. Incremental Student Numbers | — | 91 | — |
| F. Incremental Cost per Student-Year (i.e. D ÷ E) | — | £385 | — |

numbers can be accommodated with a 44 percent increase in the total cost of the course.

4. Discussion of the results

The results for all eight proposals costed are summarised in Table 3 and Figure 2. All have comparatively low incremental costs per student-year, which leads to marked falls in the existing average cost per student-year between 1969/70 and 1976/77. This is important because it is based upon the additional resources which professors themselves estimate they will need, and embodies no deliberate attempt to find economies. The economies of scale arise through the fuller utilisation of existing capacity.

The fall in average cost varies from 11 per cent for Ophthalmic Optics to 71 per cent for Industrial Technology and Management. The average cost per student-year of the 'Aggregate Proposal', which is the average for all eight proposals weighted by the student numbers in each, declines from £778 to £551 over the period in question, a fall of 30 per cent. The incremental cost also varies considerably between proposals, from zero for Electrical Engineering to £661 for Ophthalmic Optics, but averages £195 for all eight proposals.

The incremental cost broadly reflects the current degree of excess capacity of specialised resources available within the school concerned. The evidence suggests that the economies of expansion arise more from the utilisation of this excess capacity than from economies of scale inherent within the nature of the course structure. In the original average costing study mentioned earlier, excess capacity has already been allocated to the school, so that any expansion utilising this capacity is cost-free in the sense that it does not add to the cost of the school. In this situation, any

economies of scale arising from the course structure, which determines the *need* for extra resources during expansion, will be concealed by the excess capacity available.

Although all eight courses examined can expand with considerably less than *pro rata* increases in cost, some schools are in a more favourable position than others to achieve low cost expansion. Thus Pharmacy and Chemical Engineering are comparatively well endowed with resources, as shown by their low incremental costs of £95 and £58 respectively. Similarly, Electrical Engineering will be able to expand with a negligible increase in cost, although here the situation is complicated by the fact that student enrolments have dropped short of the planned expansion in recent years. Even ignoring this factor, however, it is likely that there is still excess capacity in the School, particularly in laboratory accommodation.

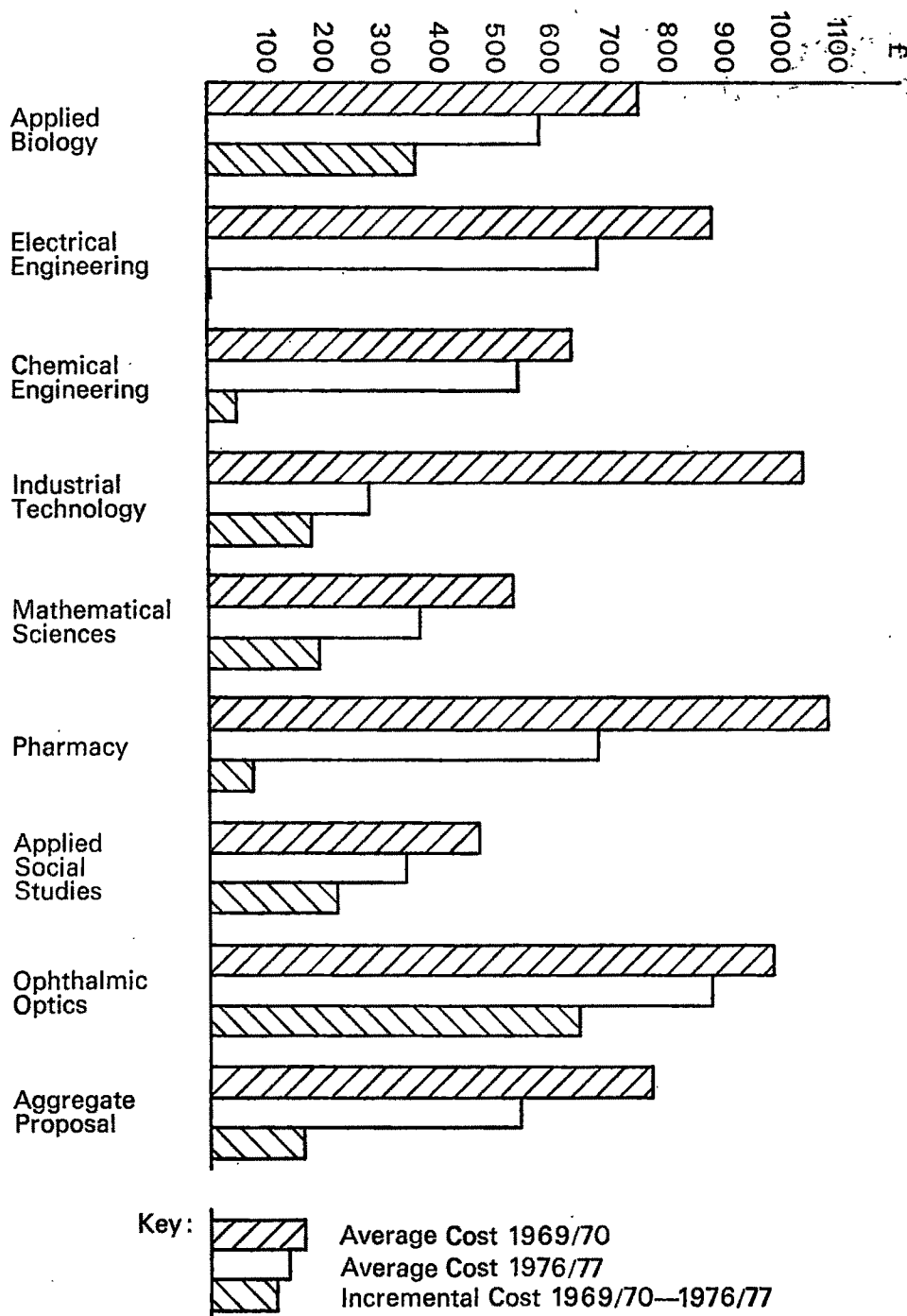
On the other hand, Applied Biology, like Ophthalmic Optics, is reaching maximum capacity in present laboratory facilities and therefore will be relatively expensive to expand (£385 and £661 respectively). In the School it is felt that their past demands for resources have been modest, and that they should not be penalised when there is a real need for extra resources for expansion.

Between these extremes are found schools like Mathematical Sciences and Applied Social Studies where resource requirements are not great, and where, in consequence, excess capacity is less likely to arise. Industrial Technology should also be included in this group, although being only recently established, the School is something of a special case. The average cost in 1969/70 is probably inflated by the fact that only the first two of the four years of

TABLE 3: Summary of the Results for the Eight Proposals and the Aggregate Proposal

| | | | Applied Biology | | | |
|--------------------------------------|----------|----------|------------------------|----------|--|-----|
| | | | 1969/70 | 1976/77 | Percentage Change from (1) to (2) | |
| | | | (1) | (2) | (3) | |
| A. Total Cost | | | £79,452 | £114,487 | 44 | |
| B. Total Student Numbers | | | 103 | 194 | 88 | |
| C. Average Cost per Student-Year | | | £771 | £590 | -23 | |
| D. Total Incremental Cost | | | — | £35,035 | — | |
| E. Incremental Student Nos. | | | — | 91 | — | |
| F. Incremental Cost per Student-Year | | | — | £385 | — | |
| Continued . . . | | | | | | |
| Electrical Engineering | | | Chemical Engineering | | | |
| | | | 1969/70 | 1976/77 | Percentage Change from (4) to (5) | |
| | | | (4) | (5) | (6) | |
| | | | (7) | (8) | Percentage Change from (7) to (8) | |
| | | | (9) | | | |
| A. | £220,087 | £220,087 | 0 | £225,507 | £229,498 | 2 |
| B. | 247 | 311 | 26 | 349 | 420 | 20 |
| C. | £891 | £708 | -21 | £646 | £546 | -15 |
| D. | — | — | — | — | £3,991 | — |
| E. | — | 64 | — | — | 71 | — |
| F. | — | — | — | — | £58 | — |
| Continued . . . | | | | | | |
| Industrial Technology | | | Mathematical Sciences | | | |
| | | | 1969/70 | 1976/77 | Percentage Change from (10) to (11) | |
| | | | (10) | (11) | (12) | |
| | | | (13) | (14) | Percentage Change from (13) to (14) | |
| | | | (15) | | | |
| A. | £31,356 | £75,253 | 140 | £76,812 | £105,781 | 38 |
| B. | 30 | 252 | 740 | 142 | 274 | 93 |
| C. | £1,045 | £298 | -71 | £541 | £386 | -29 |
| D. | — | £43,897 | — | — | £28,969 | — |
| E. | — | 222 | — | — | 132 | — |
| F. | — | £198 | — | — | £219 | — |
| Continued . . . | | | | | | |
| Pharmacy | | | Applied Social Studies | | | |
| | | | 1969/70 | 1976/77 | Percentage Change from (16) to (17) | |
| | | | (16) | (17) | (18) | |
| | | | (19) | (20) | Percentage Change from (19) to (20) | |
| | | | (21) | | | |
| A. | £250,279 | £264,294 | 6 | £42,370 | £62,090 | 47 |
| B. | 230 | 377 | 64 | 89 | 170 | 91 |
| C. | £1,088 | £701 | -36 | £476 | £365 | 23 |
| D. | — | £14,015 | — | — | £19,720 | — |
| E. | — | 147 | — | — | 81 | — |
| F. | — | £95 | — | — | £243 | — |
| Continued . . . | | | | | | |
| Ophthalmic Optics | | | Aggregate Proposal | | | |
| | | | 1969/70 | 1976/77 | Percentage Change from (22) to (23) | |
| | | | (22) | (23) | (24) | |
| | | | (25) | (26) | Percentage Change from (25) to (26) | |
| | | | (27) | | | |
| A. | £57,926 | £75,120 | 30 | £983,789 | £1,146,610 | 17 |
| B. | 58 | 84 | 45 | 1,248 | 2,082 | 67 |
| C. | £999 | £894 | -11 | £788 | £551 | -30 |
| D. | — | £17,194 | — | — | £162,821 | — |
| E. | — | 26 | — | — | 834 | — |
| F. | — | £661 | — | — | £195 | — |

FIGURE 2: Summary of the Cost per Student-Year for each Proposal and for the Aggregate Proposal



the course were in operation, while the subsequent enormous expansion in student numbers may have led to an under-estimation of the additional resources required, especially as the School, because of its inter-disciplinary nature, relies extensively on the

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and others with relatively little. The evidence suggests that it is the larger schools which have the greatest excess capacity. The three large courses costed – Chemical Engineering, Electrical Engineering and Pharmacy – are sharply distinguished from the others by their very low incremental costs. The incremental cost of these proposals, weighted by the student numbers on each, averages only £64, compared to the average of £262 for the others. This situation arises not only because the big courses have an excess capacity in 'fixed' resources like rooms and equipment, but also because they show a willingness to expand with a much reduced marginal staff: student ratio.⁸ The big courses find this possible because although the additional student numbers involved are fairly large, the expansions are not great in proportion to the existing totals. The average staff: student ratios of such courses, therefore, will not greatly deteriorate during expansion. In contrast, the smaller schools seem to live a more hand-to-mouth existence, having modest ambitions and receiving only modest allocations of resources. Thus contrary to popular opinion, it may well be that it is the large schools, in which the university has chosen to concentrate expansion, which offer the greatest scope for economies through more expansion.

Although the results show that considerable economies of scale can be obtained without deliberate attempts at economy, sensitivity tests were carried out on the incremental costs to find which resource has the biggest impact on costs. The results of such tests were likely to differ from those carried out on average cost, which is important because of the concern with future planned expenditures. These can be modified relatively easily because they have not yet occurred, in contrast to present expenditures, which are committed in advance and thus cannot easily be reduced. Existing equipment and buildings have to be maintained and academic staff cannot be dismissed, but future commitment need not be increased by adding to the stock of these resources, and this is often possible because of present surplus capacity.

The tests showed that the greatest potential for further economies lies in reducing academic staff requirements since they form the bulk of the cost of most proposals. Should the savings lead to a decline in the quality, if not the quantity, of the output of student-years, then the savings may be false ones. However, the Report suggests a method for pro-

gressively 'worsening' the staff: student ratio associated with a particular course as student numbers on it increase.⁹ This economy can be achieved without reducing the quantity or quality of the teaching received by students and without increasing the teaching load of staff.

5. The aggregate expansion

The costing of individual expansion proposals gives insight into resource requirements at the level of the school or department. Each proposal differs from the next in terms of its course structure, the degree of expansion of student numbers proposed, the present and future utilisation of resources, and thus the present and future levels of cost per student.

It is possible also to aggregate the cost of the eight undergraduate proposals investigated. By cancelling out their individual special features, this should indicate the general trends of expansion for the University as a whole. The validity of such an approach, however, depends upon the degree to which the sample of proposals is representative. This is difficult to judge.

The proposals cover all of the present four Boards of Study at Bradford University (*i.e.* Engineering, Life, Physical, and Social Sciences), while in terms of student numbers, 1,248 undergraduate students out of the total University population of 2,861 in 1969/70, or 2,082 out of the expected population of 4,403 in 1976/77, are covered. Even so, the sample does show a bias away from the Social Sciences.

This bias is not accidental, and results from the difficulty of estimating future costs when large organisational changes are planned. The possible changes in Social Sciences include schools breaking away to establish two new Boards of Study, the development of three major new courses, and the construction of a new 'arts based' building. Such changes should reduce the potential for economies of scale in this area in the short-run at least. The Aggregate Proposal, therefore, may be more representative of the other three Boards of Studies where the expansion situation is relatively straightforward.

In the costing of individual proposals it was assumed that the increase in student numbers on each was insufficient to cause any expansion in central expenses. Although this is a reasonable assumption in costing proposals separately, it becomes untenable when aggregating several proposals where the overall expansion in student numbers is large. The assumption of constant central expenses, therefore, amounts to an 'optimistic' forecast when considering the Aggregate Proposal. A 'pessimistic'

⁸The marginal staff: student ratio is obtained by matching *additional* staff numbers with *additional* student numbers; this differs from the normal staff:student ratio, *i.e.* the average ratio, which is calculated by matching *total* staff numbers with *total* student numbers.

⁹*Costs and Potential Economies, op. cit.*, chapters 4 and 5.

forecast can be produced by recosting the Aggregate Proposal on the basis that central expenses will increase pro rata with student numbers, which probably overstates the likely outcome. Similarly, the assumption that course costs remained constant during 1970/71 can be changed so that they, too, are assumed to increase pro rata with student numbers.

Table 4 summarises the revised costing of the Aggregate Proposal. The effect of the 'pessimistic' assumptions is considerable. Between 1969/70 and 1976/77 the average cost per student-year falls from £788 to £641, instead of to £551. This represents a decline of 19 per cent, which is more than a third lower than the 'optimistic' forecast of 30 per cent. The incremental cost per student-year now averages £422, more than double the previous figure of £195. Nonetheless, the 19 per cent fall in average cost arising from the expansion of the Aggregate Proposal still remains a substantial economy of scale.

Both 'optimistic' and 'pessimistic' forecasts are shown in Figure 3. The actual outcome should lie between these two extremes.

6. Incremental costing and university planning

In university decision making, incremental costs are potentially more useful than average costs. Average costs can only show a situation as it existed at a given point of time in the past. On the other hand, incremental costs are costs which arise in the future as the result of present decisions. Broadly speaking, the incremental cost of a decision can be defined as the change in future costs from the level at which they would have been had the decision not been taken. Thus the decision to expand a particular course will lead to a rise in future costs, and it is this change which is the cost of the decision.

For planning purposes, however, the method has certain drawbacks. The data is sufficiently detailed to require a lot of collection work, particularly as much of it is new to current university data collection systems. But this problem, no doubt, could be overcome by the installation of suitable collection methods at the school and central administration levels.

A drawback of the exercise under discussion is that only one expansion in each course has been costed. This might be satisfactory for university planning where the choice lies between one expansion and another, but in the majority of cases the choice lies between a little more of one expansion and a little less of the other, and vice versa. In this situation, costings for a variety of expansions in each course would be required, each new version of which would require a new lot of data. But it might prove possible on each course to cost the expansion desired under the present priorities (i.e. mainly non-economic), and then to examine how the cost would vary if the expansion were to be slightly increased or decreased. In this way, the amount of data required would be reduced, and the economic factor could have a marginal influence on the final decision.

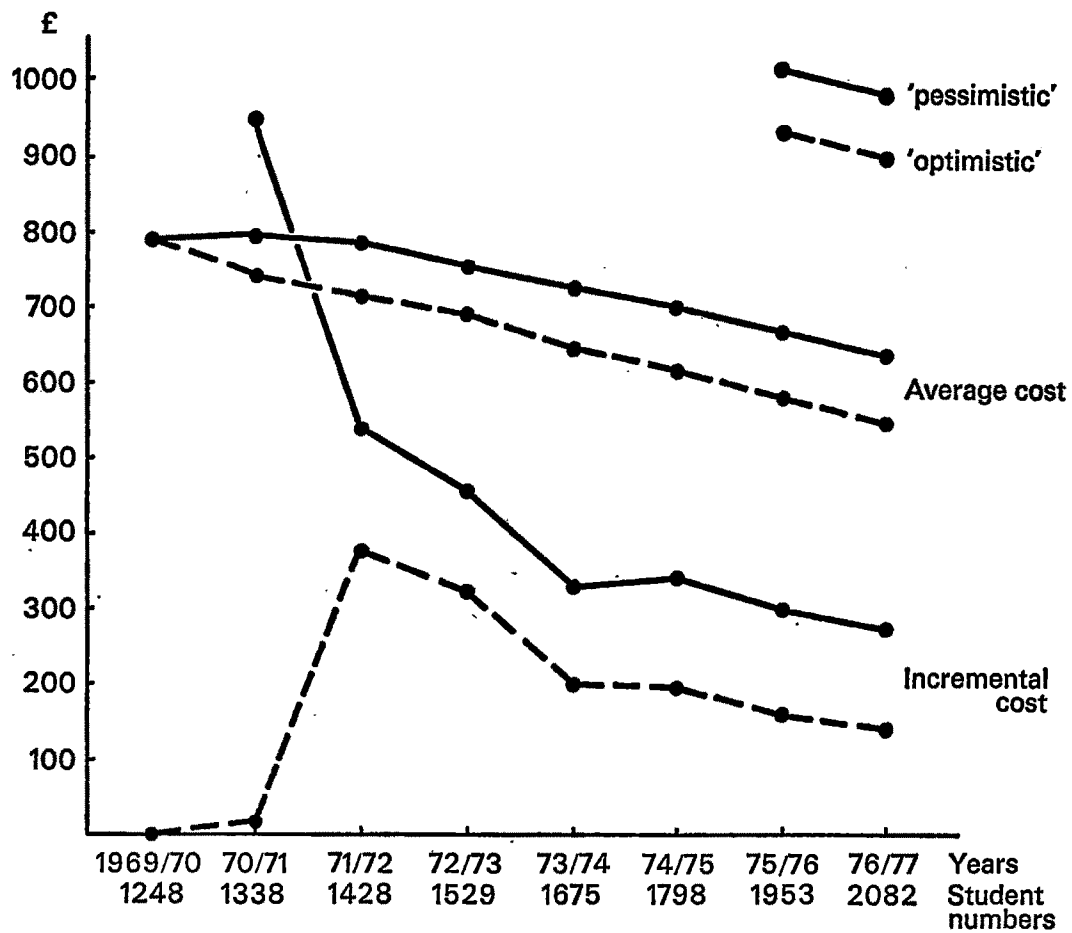
7. Conclusions

Universities are intrinsically inefficient institutions. But it would be an immeasurable loss if the exacting standard of the work which they do is sacrificed in the blind search for economy. Nonetheless, the evidence of this study shows that there is a considerable amount of underutilised capacity available, and that expansion over the next five or ten years should seek, where possible, to utilise this capacity more fully.

TABLE 4: Aggregate Proposal – recosted assuming increasing central expenses

| Items of Expenditure | TOTAL COST | | Percentage Change between (1) and (2) (3) |
|---|----------------|----------------|---|
| | 1969/70 (1) | 1976/77 (2) | |
| 1. Capital and Maintenance Costs | £364,685 | £429,429 | 18 |
| 2. Teaching Costs | 424,673 | 587,393 | 38 |
| 3. Administrative Expenditure | 130,715 | 208,335 | 59 |
| 4. Library Expenditure | 28,201 | 48,712 | 73 |
| 5. General Expenditures | 35,515 | 61,549 | 73 |
| A. Total Cost | £983,789 | £1,335,418 | 36 |
| B. Total Student Numbers | 1,248 | 2,082 | 67 |
| C. Average Cost per Student-Year (i.e. A ÷ B) | £788 | £641 | -19 |
| D. Total Incremental Cost | — | £351,629 | — |
| E. Incremental Student Numbers | — | 834 | — |
| F. Incremental Cost per Student-Year (i.e. D ÷ E) | — | £422 | — |

FIGURE 3: AGGREGATE PROPOSAL—Average and Incremental Costs
Per Student-Year—'Optimistic' and 'Pessimistic'
Forecasts, 1969/70—1976/77



Differential rate of return method for reporting holding gains earned by fixed assets

Lawrence A. Gordon

Introduction

The accounting system should report economic events for managerial and external investment decisions. Unfortunately, due to disparities such as those between economic and accounting income, many economic events are either never recorded or are recorded subsequent to, or previous to, the time of their occurrence, by the accounting system. If the accountant's job is to be successfully completed, accounting systems should generate more information on economic income. Managers and investors should have this information for making decisions. Therefore, a logical question to pose is: How can we further adapt economic income to an accounting system?

This paper will attempt to develop a theoretically sound and mechanically-workable method for incorporating one aspect of economic income, not already incorporated, into the accounting system; namely, the economic income earned by fixed assets. Although this is only one step in bringing the two income concepts closer, it is an important one when we consider that most companies have a significant portion of their total capital tied up in fixed assets.

It will be argued that holding gains (losses) are really changes in the economic rate of return on the assets. Therefore, a plan for earning these holding gains according to the increase or decrease in the rate of return, the 'differential rate of return', will be proposed. Subsequently, it will be shown that this proposed plan is readily adaptable to existing accounting systems.

The conversion model

It is generally agreed that assets should be defined as rights to future service potentials or future economic benefits.¹ Assuming no salvage value, this concept can be algebraically expressed as:

¹For example, see Supplementary Statement No. 1 of the American Accounting Association on 'Accounting for Land, Building & Equipment', July, 1964.

$$V_0 = \sum_{i=1}^n \frac{R_i}{(1+r)^i}, \text{ where } V_0 = \text{discounted future service potential in time zero}$$

R_i = the expected net cash inflow from the asset for the period

r = the discount rate, or acceptable rate of return based on a particular time value of money after considering the cost of the capital, net of inflationary considerations.²

n = number of periods that the asset provides service potential.

If we accept the above definition of an asset, we should then measure an asset's value accordingly.³ This value is often referred to as the economic value. The difficulties involved in this type of measurement have led many to argue for some form of market value as an approximation of the economic value, but this author does not agree with these suggestions. Therefore, it is argued that an asset's value should be measured by the discounted net cash inflow of its output, as expressed by the above formula.⁴ It is true that this method involves estimating cash flows. However, an estimate of the correct value is considered to

² One might argue for a uniform discount rate for all companies such as the rate of return computed on all stock traded on the New York Stock Exchange. This rate is calculated by the Center of Research and Security Prices of the University of Chicago.

³ The above formula is for the discrete case of discounting. If we talk about a continuous model then the formula takes the form:

$$\int_0^n R_t e^{-rt} dt$$

be better than utilizing a 'certainty value' which is known to be incorrect, or at best, rarely correct. Estimating cash flows generated from a particular asset is best left to the individual firm owning the asset and not to the market which suffers from many imperfections. As stated by Professors Rouen and Sorter:

Although many sources of information exist for identifying the impact of the market or industry on future cash flows, only the firm itself and its management have current knowledge of its specific decisions and plans.⁵

At this point one may ask whether or not expected cash flows are capable of meeting the objectivity criterion that accountants so highly revere. This author would argue that objectivity in approach and in applying estimation procedures should be the test, not the traditional view of requiring some documented proof of an exact amount. If this view of objectivity is accepted, then surely expected cash flows can objectively be determined.

The only depreciation method which is consistent with the above definition of an asset is referred to as the 'economic depreciation' method. According to the economic depreciation method, one would subtract the asset's discounted future service potential of this period from last period, the difference being depreciation. In other words, the economic depreciation of a period is the decline in the asset's economic value. For example:

$$\text{If } V_0 = \frac{\$60}{(1+0.10)} + \frac{\$55}{(1+0.10)^2} = \$100,$$

$$\text{and } V_1 = \frac{\$55}{(1+0.10)} = \$50,$$

then depreciation for the first period = $V_0 - V_1 = \$50$.

In the above example, the economic income after depreciation is 10% of the declining value, which is the rate of return, or discount rate.⁶ Stated differently, the asset's value at the beginning of the first period was \$100. Ten per cent of \$100 equals \$10 which, when deducted from the \$60 cash inflow of the first period, leaves \$50 for depreciation. In the second period, the economic depreciation would be $V_1 - V_2$

$$\text{which equals: } \frac{\$55}{(1+0.10)} - 0 = \$50, \text{ where } V_2 = 0.$$

The income, or rate of return, after depreciation for the second period is 10% of the declining value, or $0.10 \times \$50 = \5 . Therefore, the net cash inflow of \$55 less the \$5 income leaves \$50 as the return of the declining value – the economic depreciation.

The concept of income implicitly assumed within the above example is the one advocated by J. R. Hicks. Hicks defined income thus, '... we ought to define a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning'.⁷ Algebraically this income concept may be related to the income from a fixed asset, where an asset is defined according to its economic value, as follows:⁸

$$\text{A. } Y_t = (V_t + R_t) - V_{t-1}, \text{ where } V_t = \sum_{i=1}^{n-t} \frac{R_{t+i}}{(1+r)^i},$$

$t = 0, 1, \dots, n$, and Y_t = income for period t .

$$\text{Since } V_{t-1} = \frac{R_t}{(1+r)} + \frac{V_t}{(1+r)}$$

$$\text{Therefore, } V_t + R_t = V_{t-1}(1+r)$$

B. Then $V_t = V_{t-1}(1+r) - R_t$
through substitution of B into A.

$$\begin{aligned} \text{A. } Y_t &= V_{t-1}(1+r) - R_t + R_t - V_{t-1} \\ &= V_{t-1}r \\ &\text{from A.} \end{aligned}$$

$$\text{C. } D_t = V_{t-1} - V_t = R_t - Y_t, \text{ where } D_t = \text{economic depreciation for period } t.$$

It should be realized that we are talking of ex ante income. In order for our ex post income to equal the ex ante, our expectations of the future would have to be exactly correct.⁹ This latter event would indeed be rare. In fact, the probability of it occurring is close to zero. Consequently, we will probably have periodic unexpected income which results from the difference between the expected and the actual cash flows.¹⁰ Furthermore, as additional information is available we will want to revise our asset's value based on our new expectations. These later changes result from the activity of 'holding' such assets and are, therefore, called 'holding gains or losses'. As stated by the Com-

⁴ For an excellent exposition on why the market value is not a representative figure of the true economic value of an asset see Lawrence Revsine's article, 'Replacement Cost and Economic Income', *The Accounting Review*, July 1970, pp. 513-23, and his Ph.D. Dissertation entitled 'Replacement Cost Reports to Investors: A Relevance Analysis', (Northwestern University, 1968).

⁵ Joshua Rouen and George Sorter, 'Relevant Accounting', *The Journal of Business*, April 1972, p. 260.

⁶ Edwards & Bell call this subjective profit. *The Theory and Measurement of Business Income*, University of California Press, California, 1965, p. 38.

⁷ J. R. Hicks, *Value and Capital*, Oxford University Press, Amen House, London, Second Edition, 1948, p. 172.

⁸ Hicks' income concept has been expressed algebraically by many other authors.

⁹ Estimating the future net cash inflows is the subject of another paper presently being prepared by this author.

¹⁰ J. R. Hicks op. cit., (pp. 178-9), calls this windfalls and points out that only expected income has relevance for measuring managerial decisions.

mittee on Concepts and Standards of the American Accounting Association in 1964, 'Holding Gains and Losses relating to long-lived assets result from holding such assets during periods of value change (other than value change resulting from depreciation)'.¹¹ These holding gains or losses can be divided into two parts: (1) change in value of specific asset, (2) price level changes. In this paper, we will be concerned only with part (1), assuming a constant price level.

The question that must be answered is: How can we logically argue for valuing fixed assets according to output service potential and depreciating them according to the economic depreciation method, while at the same time accounting for holding gains (or losses)?

Proposed solution: Recording assets according to output service potential and recording economic depreciation thereupon presents no theoretical problem (providing the acquisition cost equals the discounted output value) when holding gains, or losses, do not occur.¹² This was already seen above and will not be repeated. However, if holding gains occur from one period to the next, we have a situation where the return on the investment is increasing. If one argues for recognizing gains when earned, regardless of when realized, as this author does, then one has to record the holding gain at the time of reassessing the expected cash flows.¹³ Theoretically, you have a gain which should be immediately recognized as income. However, the theoretical gain is based on expected cash flows which will rarely, if ever, be exactly correct. In fact, measurement errors will probably account for a significant portion of the holding gain (loss), since expected cash flows represent an anticipated mean value about which the actual cash flows will fluctuate. Consequently, the immediate earning of these holding gains will most likely create unrealistic fluctuations, of a large proportional magnitude, in the income figure. Therefore, it is desirable to earn these gains (losses) in such a manner as to minimize the spurious

income fluctuations. On the other hand, the proportional fluctuations in asset valuations will be of a much lower order of magnitude, since the base is so much greater. Therefore, showing the holding gains (losses), in their entirety, for asset valuation purposes would be informative and yet not lead to serious misrepresentation in the event of a significant measurement error. The proposed solution is to:

1. Record the full anticipated holding gain for asset valuation purposes.
2. Defer the anticipated holding gain for income purposes.
3. Set the undepreciated asset value equal to the new expected cash flows and determine a new rate of return on the fixed asset investment. The differential between the new rate of return under the new expectations multiplied by the undepreciated asset balance, and the old rate of return multiplied by the undepreciated asset balance, is the portion of the holding gain earned in the next period. This method for earning the holding gain will hereafter be referred to as the 'differential rate of return' method.

Any excess revenue received, on a periodic basis, above the amount expected can be thought of as unexpected income.¹⁴ In effect, the above solution will report the increase in the asset value and the economic depreciation according to the new expected cash inflows, but the increased asset value (holding gain) will be earned over the productive life of the asset, irrespective of when realized. This method accomplishes the following objectives:

1. Recognizes an asset's value according to its rights to future economic benefits (economic value of asset).
2. Recognizes holding gain as earned, not realized, over the productive life of the asset. In effect, this will result in less spurious fluctuations of income than if the full holding gain had been recognized in the period of determination – a desirable result in light of the error involved in estimating cash flows.
3. The differential rate of return method converts unexpected holding gains into expected income. This permits better evaluation of management performance, which should be based only on expected income. If the asset is sold, the portion of holding gain still deferred is not used in evaluating management performance because it repre-

¹¹ Committee on Concepts and Standards – Long Lived Assets, 'Accounting for Land, Building & Equipment', Supplementary Statement No. 1, *The Accounting Review*, July 1964, p. 693.

¹² Any difference between the acquisition cost and the initial discounted output value can be handled in a manner related to the solution which follows, as already suggested by Harold Bierman in his book, *Financial Accounting Theory*, The Macmillan Co., New York, 1965, pp. 128-130. This discussion by Bierman does not deal with the problem of holding gains (losses) resulting from changing expected cash flows.

¹³ Theoretically, there is no basis for applying the realization concept of income, as stated by Dr. Eldon Hendrickson, 'The realization concept has, therefore, become a pragmatic test for the timing of revenue. While many attempts have been made to give it theoretical content, it continues to lack analytical precision. . . .' *Accounting Theory*, Richard D. Irwin, Inc., Illinois, p. 167.

¹⁴ The difference between the periodic actual cash flow and the expected cash flow (estimation error) is income for the period because the asset value did not increase at the beginning of the period therefore permitting us to consume the extra amount during the period and be as well off at the end as we were at the beginning.

sents the unconverted portion of unexpected holding gains, although it would be recognized as earned in the period of sale.

An example of the 'differential rate of return' method should prove helpful.

Assume:

$$V_0 = \frac{\$60}{1+0.10} + \frac{\$55}{(1+0.10)^2} + \frac{\$53.24}{(1+0.10)^3}$$

then

$$V_1 = \frac{\$55}{(1+0.10)} + \frac{\$53.24}{(1+0.10)^2}$$

$$V'_1 = \frac{\$60}{(1+0.10)} + \frac{\$55}{(1+0.10)^2}$$

(primes indicate new expected net cash inflows for following periods)

The holding gain at the end of the first period, if the expectations were exactly correct, equals:¹⁵

$$V'_1 - V_1 = \left[\frac{\$60}{(1+0.10)} + \frac{\$55}{(1+0.10)^2} \right] - \left[\frac{\$55}{(1+0.10)} + \frac{\$53.24}{(1+0.10)^2} \right] = \$100 - \$94 = \$6$$

According to the proposed solution, the asset value would increase by \$6 in the first period. However, this holding gain of \$6 will be deferred income and taken into the income stream as earned according to the 'differential rate of return' method. The first period depreciation, in this example, equals $V_0 - V_1$:

$$\left[\frac{\$60}{(1+0.10)} + \frac{\$55}{(1+0.10)^2} + \frac{\$53.24}{(1+0.10)^3} \right] - \left[\frac{\$55}{(1+0.10)} + \frac{\$53.24}{(1+0.10)^2} \right] = \$140 - \$94 = \$46$$

In other words, if we take the net cash flow for this period of \$60.00 and deduct the return (economic income) of 10% on the \$140 asset value, \$14, we are left with the \$46.00 return of the declining value - depreciation [$\$60.00 - (\$140.00 \times 0.10) = \$46.00$]. However, at the end of the period, the asset's new value of \$100 ($\$140.00 - \$46 + \6) has been shown,

separated into two parts: $\$94 (140 - 46) + \6 . We can view economic depreciation for subsequent periods as being based on two components: (a) old value, and (b) holding gain. Computation of the depreciation figures, for the end of period 2, would be as follows:

$$(1) V_1 - V_2 = \left[\frac{\$55}{(1+0.10)} + \frac{\$53.24}{(1+0.10)^2} \right] - \left[\frac{\$53.24}{(1+0.10)} \right] = \$94 - \$48.40 = \$45.60$$

(2) The additional depreciation on the increase in the asset valuation is:

$$[V'_1 - V'_2] - [V_1 - V_2] = \left[\left(\frac{\$60}{(1+0.10)} + \frac{\$55}{(1+0.10)^2} \right) - \left(\frac{\$55}{(1+0.10)} \right) \right] - [\$45.60] = [\$100 - \$50] - [\$45.60] = \$4.40$$

Total economic depreciation for the second period equals $\$45.60 + \$4.40 = \$50$.

Note that the sum of (1) and (2) above is equal to $[V'_1 - V'_2] = \$100 - \$50 = \$50$, the total depreciation for period 2. Separation $[V'_1 - V'_2]$ into $[V_1 - V_2] + [(V'_1 - V'_2) - (V_1 - V_2)]$ permits us to readily view the two separate components of the depreciation figure. The economic income for the second period on the asset *before* the recording of the holding gain would equal $\$9.40 = 0.10 \times \$94.00 = \$55.00 - \45.60 .

The third period depreciation will equal $[V_2 - 0] + [(V'_2 - 0) - (V_2 - 0)] = \$48.40 + \$1.60 [\$50 - \$48.40] = \50.00 . The economic income for this period *before* the recording of the holding gain would be $\$4.84 = 0.10 \times \$48.40 = \$53.24 - \48.40 .

To compute that portion of the holding gain earned, we must take the old value of V_1 , \$94.00, and set it equal to the new expected net cash inflows, to determine a new rate of return:

$$V_{1N} = \$94 = \frac{\$60}{(1+r)} + \frac{\$55}{(1+r)^2},$$

where r = rate of return.

Solving for r , we get $r = 0.148$ and $V'_{1N} = 52.265 + 41.733 = \94.00 . Therefore, the holding gain earned in the second period equals:

$$(V'_{1N} \times 0.148) - (V'_1 \times 0.10) = (\$94 \times 0.148) - (100 \times 0.10) = 13.912 - 10.00 = 3.912.$$

The holding gain earned during the third period equals:

¹⁵ It has been assumed that the holding gain has taken place at the last day of the first period, otherwise proration for the previous period is necessary. Also, it should be emphasized that holding gains do not result from estimation errors but rather result from changes in the economic conditions surrounding the specific asset. Errors in expectations, for a given economic condition, will be taken into income in the corresponding period as unexpected operating income.

$\cdot 148 \times V'_{2N}$ (where V'_{2N} equals \$47.9094, or

$$\frac{\$55}{(1 + \cdot 148)})$$

$$- [\cdot 10 \times V'_2] = 7.09059 - 5.00 - 2.09059.$$

Consequently, the total holding gain earned, for periods two and three, equals $\$3.912 + \$2.090 = \$6.00$.¹⁶ Total economic income for periods two and three equals $\$9.40 + \$3.912 + 10\%$ of the \$6.00 increase in asset value ($\cdot 10 \times \$6.00$) = \$13.91, and $\$4.84 + \$2.09 + 10\%$ of the remaining \$1.60 (\$6.00 - \$4.40) increase in asset value ($\cdot 10 \times \$1.60$) = \$7.09, respectively; or $\cdot 148 \times \$94.00 = \13.91 , and $\cdot 148 \times \$47.9094 = \7.09 .

Table I summarizes the data for the above example.

Since one of the primary goals of this paper is to

¹⁶ An implicit assumption in this problem is that at the end of the second holding period no holding gain or loss resulted. If such a gain or loss occurred, this would have only complicated the computations, not the theory. If an additional holding gain occurred in period two, then the asset value would be written up while at the same time the deferred income would also increase. On the other hand, if a holding loss occurred in period two, then the asset value would have to be written down and a deferred cost amount would be set up. The holding gain (loss) of one period could be offset against the holding loss (gain) in a following period with respect to the same asset.

TABLE 1
Asset Value

| No Holding Gain | When Holding Gain Exists | Computation of Holding Gain |
|---|---|---|
| $V_0 = \frac{\$60}{(1 + \cdot 10)} + \frac{\$55}{(1 + \cdot 10)^2} + \frac{\$53.24}{(1 + \cdot 10)^3}$ $= \$140.00$ | | |
| $V_1 = \frac{\$55}{(1 + \cdot 10)} + \frac{\$53.24}{(1 + \cdot 10)^2} = \94 | $V'_1 = \frac{\$60}{1 + \cdot 10} + \frac{\$55}{(1 + \cdot 10)^2} = \100.00 | $V'_1 - V_1 = \$6$ |
| | $V'_{1N} = \frac{\$60}{1.148} + \frac{\$55}{(1.148)^2} = \$94.00$ | |
| $V_2 = \frac{\$53.24}{1 + \cdot 10} = \48.40 | $V'_2 = \frac{\$55}{(1 + \cdot 10)} = \50 | |
| | $V'_{2N} = \frac{\$55}{1.148} = \47.9094 | |
| Economic Depreciation | | |
| No Holding Gain | When Holding Gain Exists | Extra Depreciation Remaining Increase in Asset Value |
| 1st period = $V_0 - V_1 = \$46.00$ | $V_0 - V_1 = \$46.00$ | |
| 2nd period = $V_1 - V_2 = \$45.60$ | $[V_1 - V_2] + [(V'_1 - V'_2) - (V_1 - V_2)] = \50.00 | \$4.40 \$1.60 |
| 3rd period = $V_2 - 0 = \$48.40$ | $[V_2 - 0] + [(V'_2 - 0) - (V_2 - 0)] = \50.00 | \$1.60 0 |
| Total = \$140.00 | Total = \$146.00 | \$6.00 |
| Extra Earnings | | |
| | Holding Gain Earned | |
| | 2nd period (\$13.91 - \$10) | |
| | $(\cdot 148 \times 94) - (\cdot 10 \times 100)$ | \$3.912 |
| | 3rd period (\$7.09 - \$5) | |
| | $(\cdot 148 \times 47.9094) - (\cdot 10 \times 50)$ | \$2.090 |
| | Total (rounded off) | \$6.00 |
| Net Cash Flow - Economic Depreciation = Income for Period | | |
| No Holding Gain | Holding Gain | Additional Income |
| 2nd Period = | $\$60 - \$50 = \$10.00$ | $(\cdot 10 \times \$6.00) \cdot 60 + 3.912 = 4.51$ |
| 3rd period = $\$53.24 - \$48.40 = \$4.84$ | $\$55 - \$50 = \$5.00$ | $(\cdot 10 \times \$1.60) \cdot 16 + 2.090 = 2.25$ |
| | | Total $\cdot 76 + 6.1000 = 6.75$ |
| Breakdown of Total Extra Earnings when Holding Gain Exists | | |
| Period 2 = $\$3.91 + \$6.00 = \$9.91$ | OR $(\cdot 048 \times \$94) = \4.51 | |
| Period 3 = $\$2.09 + \$1.60 = \$3.69$ | OR $[(\cdot 148 \times 47.9094) - (\cdot 1 \times 48.40)] = \2.25 | |
| Total Income for Period* | | |
| | Period 1 - \$14.00 | $(\cdot 10 \times \$140.00)$ |
| | Period 2 - \$13.912 | $(\cdot 148 \times \$94.00)$ |
| | Period 3 - \$7.09 | $(\cdot 148 \times \$47.9094)$ |

*This agrees with our definition of economic income after considering the new required rate of return.

devise a conversion of economic income to accounting income which could be accommodated by existing

accounting systems, let us look at the way the above example would appear in terms of accounting entries.

| First Period | | | |
|-------------------------------|---------|-------------------------------|---------|
| Holding Gain Not Recorded | | Holding Gain Recorded | |
| Cash | \$60.00 | Cash | \$60.00 |
| Net Revenue | \$60.00 | Net Revenue | \$60.00 |
| Economic Depreciation Expense | 46.00 | Economic Depreciation Expense | 46.00 |
| Accumulated Depreciation | 46.00 | Accumulated Depreciation | 46.00 |
| Net Revenue | 60.00 | Net Revenue | 60.00 |
| Economic Depreciation Expense | 46.00 | Economic Depreciation Expense | 46.00 |
| R & E Summary | 14.00 | R & E Summary | 14.00 |
| | | Fixed Asset | 6.00 |
| | | Holding Gain Anticipated | 6.00 |
| Second Period | | | |
| Holding Gain Not Recorded | | Holding Gain Recorded | |
| Cash | \$55.00 | Cash | \$60.00 |
| Net Revenue | \$55.00 | Net Revenue | \$60.00 |
| Economic Depreciation Expense | 45.60 | Economic Depreciation Expense | 50.00 |
| Accumulated Depreciation | 45.60 | Accumulated Depreciation | 50.00 |
| Net Revenue | 55.00 | Net Revenue | 60.00 |
| Economic Depreciation Expense | 45.60 | Economic Depreciation Expense | 50.00 |
| R & E Summary | 9.40 | R & E Summary | 10.00 |
| | | Holding Gain Anticipated | 3.91 |
| | | Holding Gain Earned | 3.91 |
| | | Holding Gain Earned | 3.91 |
| | | R & E Summary | 3.91 |

Extra Earning = $(\$10.00 + \$3.91) - \$9.40 = \$60(\$6.00 \times .10) + \$3.91 = \$4.51$

Extra Cash Flow = Extra Economic Depreciation of \$4.40, plus extra \$6.00 return on \$6.00 increased asset value at .10 = extra 5.00 cash flow.

| Third Period | | | |
|-------------------------------|---------|-------------------------------|---------|
| Holding Gain Not Recorded | | Holding Gain Recorded | |
| Cash | \$53.24 | Cash | \$55.00 |
| Net Revenue | \$53.24 | Net Revenue | \$55.00 |
| Economic Depreciation Expense | 48.40 | Economic Depreciation Expense | 50.00 |
| Accumulated Depreciation | 48.40 | Accumulated Depreciation | 50.00 |
| Net Revenue | 53.24 | Net Revenue | 55.00 |
| Economic Depreciation Expense | 48.40 | Economic Depreciation Expense | 50.00 |
| R & E Summary | 4.84 | R & E Summary | 5.00 |
| | | Holding Gain Anticipated | 2.09 |
| | | Holding Gain Earned | 2.09 |
| | | Holding Gain Earned | 2.09 |
| | | R & E Summary | 2.09 |

Extra Earnings = $(\$5.00 + \$2.09) - \$4.84 = \$2.25 = \$16 [(\$6.00 - \$4.40 \text{ economic depreciation already recovered} = \$1.60) \times .10] + \$2.09$.

Extra Cash Flow = Extra Economic Depreciation of \$1.60, plus extra \$1.60 return on remaining increased asset value $(.10 \times \$1.60)$ not yet collected = \$1.76.

The above solution to recording holding gains and losses has implicitly assumed that the sum of the discounted cash flow of the separate assets of a firm will equal the total value of the firm. Stated differently, the 'sum of the parts' has been assumed to equal the 'whole'. In theory, this may be true, but in practice this poses a difficult problem. For instance, can we say that the value of a horse, plus the value of a buggy, equals the value of a horse and buggy combined?¹⁷ This author's answer is that once we combine the horse and buggy we have a new asset which must be shown on the balance sheet in its new form. In other words, I would argue that our balance sheet assets should be combined according to reason-

ably independent value groups. This would mean that instead of having twenty assets, we might have five independent groups of assets made up of four items each. Once putting the assets into balance sheet groups, the difference between the total value of the

¹⁷ For a detailed discussion of the additivity problem, the following references are highly recommended: Arthur Thomas, *The Allocation Problem*, Studies in Accounting Research No. 3, American Accounting Association, 1969. K. Larson and R. Schattke, 'Current Cash Equivalent, Additivity, and Financial Action', *The Accounting Review* (Oct. 1966), pp. 634-41. J. McKeown, 'Additivity of Net Realizable Values', *The Accounting Review*, (July 1972) pp. 527-32.

firm and the sum of the value of the groups of assets represents goodwill which would be shown as a separate intangible asset.¹⁸

Also, it has been assumed that a company's time value of money has remained constant. If a company's time value of money was not constant, then the resulting changes in assets' values would have to be treated separately from holding gains (losses) so as not to permit capricious distortions of the income figure and assets' values.

Conclusion

Reporting periodic economic income earned by fixed assets requires periodic treatment of holding

gains (losses) as well as the recording of an asset's true economic value. As cash flows are expected to increase (decrease) a holding gain (loss) on the fixed asset occurs. It was advocated that holding gains (losses) are really changes in the economic rate of return on assets and should therefore be earned over their productive life. Consequently, a method for earning holding gains (losses), the 'differential rate of return' method, was proposed. Utilizing this plan involves the estimation of cash flows for asset valuation purposes. However, it is argued that an estimate of the correct value is better than using a 'certainty value' which is known to be incorrect.

¹⁸ This goodwill would be the result of the fact that the asset groups are not totally independent. If they were completely independent, then no goodwill would exist since we are valuing assets according to their expected cash flows as determined by the company owning them. In other words, to define goodwill as excess earning potential would force a comparison of one company's use of the assets against another company's use, which is not compatible with our definition of the true economic value of an asset.

Acknowledgement

The author wishes to express his appreciation to Dr. Sergei Dobrovolsky and Dr. A. Wynnyczuk for their thought provoking discussions on the general topic of relating economic analysis to accounting, as well as specific discussions on this paper. Also appreciated are the comments received from Dr. Lloyd Amey on an earlier draft of this manuscript.

Book Reviews

Forging Accounting Principles in Five Countries: A History and Analysis of Trends *Stephen A. Zeff*. (Stipes Publishing Company, Champaign, Illinois, \$3.)

This book is the result of the research carried out and used by Professor Zeff as a basis for the 1970 Arthur Andersen and Co. Lectures of the same title at the University of Edinburgh.

Professor Zeff's objective has been to provide a comparative study of the approaches adopted in different countries with programmes designed to improve the quality of financial reporting. It is Professor Zeff's belief that accounting principles should be established by 'agencies in the private sector, preferably professional accounting societies, not by government fiat, whether through legislation, Presidential or judicial decree, or administrative regulation'. This belief explains his decision to 'orient the discussion of each country's historical development around the initiatives of the principal accountancy bodies, rather than through the eyes of one or more government agencies, to the extent that they have been involved'. The five countries chosen for the comparative study are England, Scotland, Mexico, the United States and Canada.

The book contains considerable information about the historical development of the organised professional bodies in the individual countries, the characteristics of their organisational structures, the workings of various committees entrusted with the task of finding ways to improve accounting procedures, the motivating factors behind the search for accounting principles, and the reactions to professional pronouncements from members of the profession and external agencies with interest in financial reporting. The concluding chapter of the book contains a critical examination of evolving trends and a plea to the accounting profession to devote more time and effort to study the foundations of the subject it is practising.

No doubt, with an audience of United Kingdom accountants in mind, Professor Zeff begins his book with studies of the evolution of accounting 'principles' in that part of the world. According to Professor Zeff, the first evidence of interest in accounting principles in England dates from the 1930s with the formation of

the short-lived Accounting Research Association by members of the London School of Economics and 'a few practitioners', and the establishment of a research committee by the Society of Incorporated Accountants and Auditors for the purpose of '... publication of monographs on professional subjects, the formation of Research Groups, and special educational work as regards the techniques of the profession'.

In 1942 the English Institute established a Taxation and Financial Relations Committee 'to consider matters affecting taxation and the financial relationship of the business community with the Inland Revenue or other Government Departments'. The same year the committee asked Council for and was granted permission to prepare drafts of pronouncements on accounting principles. In the words of Professor Zeff, 'a concern for the inadequacy of published accounts was sufficiently strong that it demanded resolution even in the midst of war with Germany'. An important motivating factor for this concern with accounting principles appears to have been the Royal Mail case of 1931, the first major public embarrassment to be suffered by the accounting profession in Britain.

The 1960s are described by Professor Zeff as bringing a 'new climate' within the English Institute. This 'new climate' is characterised by a departure from the earlier 'insularity' and 'aloofness' of the Institute, the creation of a new Research Committee, co-operation with other accountancy bodies, the development of wider contacts by the Institute with the outside world, the creation of a Professional Standards Committee, the re-establishment of an accounting research journal, etc. The creation of this 'new climate' appears to have been facilitated by mounting criticisms of the profession in Britain and public questioning in the financial Press of the validity of the audit report following the collapse of John Bloom's Rolls Razor Ltd., in 1964, the controversy following the GEC-AEI takeover in 1967, and the Leasco-Pergamon affair of 1969. Driven into action by criticism, the English Institute issued, in December 1969, a statement of intent on accounting standards in the 70s. To implement the statement of intent, the Accounting Standards Steering Committee was

formed which launched an ambitious work programme – 20 problem areas were identified and it was predicted that these would be dealt with within five years(!)

The book reveals some disturbing features in the English experience (already preceded in the United States):

(a) A progress through disaster approach on the part of the accounting profession – its inability (or unwillingness) to act on important issues unless forced to do so by a crisis, by external criticism, or even threat of government action regarding unsatisfactory accounting procedures.

(b) Attempts to formulate pronouncements on accounting principles and practices without an agreement on the function of accounting, on accounting objectives.

According to Professor Zeff, the search for accounting principles in the five countries studied has been influenced by national characteristics and the particular social and economic environment of the countries concerned. The Scottish character of staunch independence coupled with a disdain for the constraints of imposed authority are put forward as a possible explanation for the reluctance of the Scottish Institute to issue guidance statements to members on the grounds that such matters are best left to the integrity and judgment of Institute members in the light of the quality of their training and subsequent experience. In Mexico a slowly-developing market for common stock, a rudimentary financial Press, a lack of investor demand for more informative published financial reports have not created an urgent need for research into accounting principles, considerable reliance being placed on American pronouncements. In Canada both British and American influences are noted, the latter tending to supplant the former. Yet, in spite of these external influences, the Canadian profession has been concerned to increase its capacity to identify and resolve typically Canadian problems.

The larger part of the book is concerned with the experiences of the American accounting profession in its search for accounting principles as a means of improving accounting practices. Because of its more developed securities market, more aggressive financial Press and early interest by government and other agencies in financial reporting, the United States has tended to face financial reporting problems earlier than the other four countries. The first statement in the United States dealing with auditing procedures was published with the approval of the American Institute of Accountants in 1917. It was the result of dissatisfaction with the highly variable auditing standards of the time, expressed by the recently-created Federal Reserve Board and Federal Trade

Commission, and the threat that a Federal Register may be established of public accountants whose certificates were acceptable to the Board and Commission.

The 1930s saw the accounting profession in the United States facing mounting criticism regarding financial reporting practices following the stock market collapse in 1929. Moves were made by the Institute for co-operation with the New York Stock Exchange in defining more clearly the authority and responsibility of auditors. 1934 saw the creation of the Securities and Exchange Commission to administer the Securities Act of 1933 and the Securities Exchange Act of 1934. The Commission was given vast powers to determine accounting and auditing practices used by companies in the preparation of reports required under the Acts. By 1937-38 the profession was facing mounting criticism for its inability or unwillingness to standardise accounting practices and a threat by the Securities and Exchange Commission to take steps to do so.

Largely in response to the Commission's challenge a research department of the Institute was created in 1939. It appears that the first proposals were for the development of a comprehensive statement of accounting principles to 'serve as a guide to the solution of the practical problems of day to day practice'. However, after extended discussion it was agreed that the preparation of such a statement might take as long as five years. In view of the need to begin to reduce the areas of difference in accounting procedures before the SEC lost patience and began to make its own rules on such matters, it was concluded that the Committee could not possibly wait for the development of such a broad statement of principles. As a result, an ad hoc approach was adopted regarding the solution of accounting problems. The 1950s saw growing interest in accounting principles. There was the belief that the 'brush-fire' approach to guiding the development of accounting practice had gone as far as it could and that basic research of some kind was necessary to see the issues and the solutions more clearly. From the viewpoint of the search for accounting principles, the major events of the 1950s were the report of the Special Committee on Research Programme in September 1958 and the establishment of the Accounting Principles Board a year later.

The broad problems of financial accounting were to be visualised as requiring attention at four levels: postulates, principles, rules or other guides for the application of the principles in specific cases, and research. With Maurice Moonitz as Director of Accounting Research, priority was given to the studies of postulates and principles. Research Study No 1, 'The Basic Postulates of Accounting' written by

Moonitz, was published in 1961 and Research Study No 3, 'A Tentative Set of Broad Accounting Principles' by Sprouse and Moonitz was published the following year. The studies, which caused considerable controversy, were received coldly by the Board which considered them as being too radically different from current, generally accepted accounting principles to be used as a foundation for future opinions. No future research studies on postulates and principles were authorised. Lacking a fundamental framework of reference, research into problem areas in the United States appears to have reverted to the ad hoc approach of earlier years.

Given all the goodwill in the world, the problems faced by the profession in its efforts to improve financial reporting are formidable. Another formidable obstacle is created by the vital and, unfortunately, often conflicting interest of powerful external groups in financial reports, which may make it difficult to implement proposals which represent significant departures from existing practices, if such departures are considered detrimental to the interests of the group. That government agencies themselves can have a powerful interest in financial reports as a means of attaining political objectives is amply evidenced by the 'cause celebre' – the political overriding of the Board's support for the deferral treatment of the 'investment credit'.

And so criticism of the profession continues and the basic problems of accounting principles as a means of improving accounting procedures are yet to be resolved. In 1971 two study groups were formed by the Institute: the Wheat Study Group with the task of reviewing the operations of the Accounting Principles Board, and the Trueblood Study Group with the task of refining accounting objectives. In a way, it is surprising that interest in accounting objectives comes so late as it is unlikely that an ambitious undertaking like the postulates and principles studies recommended by the Special Committee in 1958 had much chance of success in the absence of a definition of the function of accounting and a broad agreement on accounting objectives.

Perhaps one of the most unfortunate developments in the United States, evidenced by the book, is the widening gulf between practising accountants and academicians exemplified by criticism by each section of the profession regarding the research carried out by the other. For the academician all too often the research carried out by practising accountants 'is not research', while for the practising accountant the research carried out by academicians 'is not accounting'. Yet, in the opinion of Professor Zeff, long-term problems require a continuing genuine dialogue between practising accountants and academicians and an

appreciation of the necessary interdependency of their roles.

This well-written book, with a wealth of well-selected and well-presented historical information, is a timely and valuable addition to accounting literature. It should be of considerable interest to both the teacher and student of accounting as well as to the practitioner with more than just a passing interest in accounting principles and the complex problems faced by the profession to which he belongs. In this scholarly work, Professor Zeff has been at considerable pains to be fair as well as factual. Knowing his critical mind and commonsense approach, perhaps one would have wanted him to adopt a rather less neutral stance in his coverage of the chequered history of such limited progress as has been made in 'forging accounting principles in five countries'. There is at least one reader of the book who would have wanted his assessment of the practical feasibility of the ambitious research programme undertaken by the English Institute in light of his knowledge of the difficulties experienced over so many years in the United States.

BORIS POPOFF

Accountability: Standards in Financial Reporting *Peter Bird*. **Linear Programming in Financial Planning** *G. Salkin and J. Kornbluth*. (Accountancy Age Books at £3 each)

Your reviewer was recently much depressed to observe that he had been a member of the English Institute for 20 years. This, in turn, led to the reflection that few organisations have seen a more profound change in spirit over that period. In 1953 there was still a bounding confidence that what couldn't be found in the final examination syllabuses just wasn't professional knowledge: now the professional establishment spends a good deal of its time worrying over its own intellectual and philosophical inadequacy. These fears find a faithful echo in the stated purpose of both these books. Bryan Carsberg's preface to Bird's book says: 'The timeliness of this book hardly needs emphasis. Recent events have led to criticism of accounting procedures both within the accounting profession and outside it'. In his preface to Salkin and Kornbluth, John Flower says (of operational research): 'Accountants for the most part have been left behind in this development. Some have found the new techniques difficult to understand, often confused by their strange terminology – others, perhaps the majority, are unaware even of their existence.'

Can it be that as yet there's no money in these new approaches and new techniques for accountants and their clients? One fears lest this may be so; Dantzig's *Linear Programming and Extensions* has been in print

since 1963, while Kantorovich's *The Best Use of Economic Resources* came out in 1959. Both had earlier writings on the topic back into the late 1930s, so the world has known about linear programming for about 30 years. The technique produces infallible answers to instantaneous problems like 'What is the least-cost mixture I can use in a cattle-cake of given specification?', but sadly, it cannot produce a *really* convincing answer to longer-term questions like 'What product-mix should I make next month?'

The awful secret is that mathematical programming contains one little bug – its solutions cannot be broken into meaningful daily production schedules. The reason is what is known as machine interference; one can make adequate allowances for the down-time of the various machines, but one cannot be sure what *combination* of machines will be down at any one time, nor what will be the configuration of orders, raw material and partly finished goods, facing them. It follows that the production scheduler still makes up his mind what to do each day by rule-of-thumb (sometimes a most elaborate rule-of-thumb to be sure).

This problem of combinatorial mathematics is present wherever time is a dimension in the problem, and so the more ambitious applications described by Salkin and Kornbluth are undermined in the eyes of the rude mechanicals who have to get out production, transport fish, devise investment programmes and negotiate divisional transfer prices.

That said, we may be sure that someone will solve the problems of combinatorial mathematics one of these days; indeed safe-ish heuristic methods for dealing with many of them already exist. Thus there can be no doubt that every would-be accountant (who is going to be in practice well into the next millenium) *should* know a good deal about mathematical programming. So how does Salkin and Kornbluth measure up as a text-book for accountants? On the credit side, they link an elementary treatment of linear programming to most of the attempts which have appeared in the major accounting journals to use that technique in accounting and finance – including sensitivity analysis, capital investment rationing, opportunity costing and so on. On the debit, your reviewer found their didactic approach a little obscure. They deliberately omit telling students how to *do* the Simplex Method of solution (or any mathematical proofs either), and just advise them of the existence of library programs for the purpose; they then go on to material on the dual problem and sensitivity analysis which shouts for exposition from the Simplex tableaux themselves. Similarly, they don't tell the student how to tackle integer problems – who can blame them? – but then describe capital

investment problems which are essentially of this type.

It is interesting that they eschew the traditional graphic method of initial presentation: good mathematicians commonly dislike it, because it gives the more uninterested student an impression that he knows all about programming thereafter, and the rest is just mathematical rhubarb! Fair enough, if they *were* going on to describe the Simplex Method and, more importantly, the mathematical proofs of the programming techniques in general, but as we have seen, they do not. On balance, at this price, with the promise of a student edition in the Autumn at £1.50, Salkin and Kornbluth can be judged a 'fairly good buy'.

At first sight, Peter Bird's book seems to have little in common with the first title. Just under 25% of his book is devoted to a brief history of the development of 'accountability' in the public and private sectors: then the author turns to one of his main themes – that accountability in the private sector ought to include some sort of management audit, on the grounds that management of their funds is what investors are really looking for. He goes on to discuss the various other reforms currently being advocated in this area, such as the need for uniformity of accounting principles, accounting for changing price-levels, the use of alternatives to historical-cost, the need for greater independence for the professional auditor and the like. Reform in auditing technique itself is touched upon, although very, very briefly – the use of statistical sampling and audit through the computer. Your reviewer found it hard to tell precisely what audience this book is aimed towards. Possibly it is intended for the busy small-to-medium practitioner, to inform him of the general direction of developments in the professional field. It is probably in too insufficient detail in most respects for use either as a student text or as a practitioners' handbook.

Nevertheless, the book *is* interesting and deserves to be read as a companion to Salkin and Kornbluth. Professor Bird is grappling in a non-numerate way with the same problem. A business is a complex, dynamic system, which seeks some steady-state through feed-back mechanisms: accounting attempts to produce a three-dimensional picture of the present state of the system. Not easy – who could say then (who can say now) what is the real value of Mr. Maxwell's magazine empire? Both the OR man and the auditor are in the same plight because they have to use static models of dynamic systems. Maybe accounting textbook writers cannot expect to be taken seriously by the world outside until they resolve these problems, when everybody will beat a path to our doors.

TREVOR GAMBLING

Contributors to Accounting and Business Research

Volume 3 No 11 Summer 1973

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Accounting and Business Research

Accounting and Business Research

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The Measurement of Assets and Liabilities

George J. Staubus

Measuring, in the sense of ascertaining the quantity of a specified attribute possessed by an object or event, is a significant part of accounting. Without it, accounting would be unrecognizable. If it is true that the current trend in management and finance is to quantify as many aspects of decisions as possible, the role of measurement and measurers, is likely to become more important. This paper¹ is addressed to those accountants who are interested in measurement.

The measurement of assets and liabilities encompasses the measurement of all customary financial statement items because the equity of owners in a business is the excess of its assets over its liabilities while revenues, expenses, gains, losses and funds flows (or changes in financial position) are changes in assets and liabilities. If assets and liabilities can be measured at two dates, the revenues, expenses, gains and losses for the period between those dates can be measured, although some classification issues must also be resolved before income can be calculated. It is evident, then, that our subject could also be called 'valuation and income determination' except that we shall ignore the question of which changes in net assets are to be included in the calculation of income. The scope of the paper is limited to financial (non-managerial) accounting.

The paper includes some comments on the attributes, or properties, of assets and liabilities that could be of concern to accountants and one of these is chosen as the principal object of accountants' measurement efforts because of its relevance to the decisions of external users of financial statements.

Then several types of evidence of asset and liability amounts commonly available to accountants are discussed and outlined. Descriptions of nine different measurement methods which are used in accounting make up the next section. Following these descriptions, the nine measurement methods are ranked on the relevance criterion which is believed to be the primary criterion of useful financial information. Some comments on the application of the other criteria are added and a multi-faceted example is given to illustrate the application of the measurement framework presented here. The conclusion is that accountants must continue to use several different measurement methods – but with a change in emphasis in favour of methods that relate to current values.

For the sake of brevity, the background for the reasoning that follows is presented in a series of concise statements.²

- (1) The objective of accounting is to provide financial information about the economic affairs of an entity for use in making decisions.
- (2) The potential usefulness of financial information in making decisions may be appraised on the following criteria:
 - (a) Relevance – an economic attribute (or property) of an object or event is relevant to a decision if information about it is needed for optimal decision-making.

²A more complete version of this material is given in Chapters 8–10 of *Objectives and Concepts of Financial Statements*. Readers who are interested in tracing the development of these ideas may refer to my 'An Accounting Concept of Revenue,' (unpublished dissertation, University of Chicago 1954); *A Theory of Accounting to Investors* (University of California Press, 1961 and Scholars Book Company, 1971); and a number of articles, especially 'Current Cash Equivalent for Assets: A dissent,' *The Accounting Review*, October 1967; 'Determinants of the Value of Accounting Procedures,' *Abacus*, December 1970 and 'The Relevance of Evidence of Cash Flows,' *Asset Valuation and Income Determination*, Robert Sterling, editor (Scholars Book Company, 1971).

¹Adapted from W. J. Kenley and G. J. Staubus, *Objectives and Concepts of Financial Statements* (Melbourne: Accountancy Research Foundation, 1972), Chapter 11. While it is not fair to blame Mr. Kenley for any of the shortcomings of this paper, it is proper to credit him with innumerable contributions of a substantive nature as well as valuable editorial assistance.

- (b) Reliability – the extent to which a user of information may depend upon it representing what it purports to represent.
 - (c) Comparability – including interperiod comparability (which requires consistency of accounting methods), intercompany comparability, interline comparability, intraline comparability, comparability of lengths of reporting periods and comparability of before-the-event calculations and after-the-event reporting.
 - (d) Neutrality – absence of bias.
 - (e) Timeliness – optimal frequency of reporting and minimum lag after the statement date.
 - (f) Understandability – for the sake of effective communication.
 - (g) Optimal disclosure – neither too much detail nor too little.
 - (h) Readability – meaningful classifications, informative headings, judicious juxtaposition of related data and calculation of commonly needed sums, differences and ratios.
- (3) The investment decisions of creditors and owners are the most important category of decisions for which the published financial statements of corporations are used. The decisions of other external users rarely require different measures of assets and liabilities. Therefore, the measurements reflected in published financial statements should be relevant to the investment decisions of owners and creditors.
- (4) Decisions are based on predictions of outcomes of alternative courses of action.
- (5) The critical outcome from a decision to invest in corporate securities is a series of cash receipts by the investor from (a) the corporation and/or (b) the investor's successor.
- (6) The future market prices involved in 5(b) are functions of the market's (future) predictions of (a) cash flows from the corporation to security holders and (b) other factors which are thought to affect market prices, including earnings and other financial statement items.
- (7) Financial statements of the investee can only help the investor predict the investee's future financial events, e.g. cash flows, earnings and cash payments to investors. A firm's financial statements should not be expected to be helpful in the prediction of other factors influencing future security prices, such as market conditions, alternative investment opportunities and political events.
- (8) While financial statements may be used to predict accounting outputs such as earnings, recognition of such uses does not help accountants decide how to compute earnings (aside from implying that consistency of accounting methods and smoothing of income are desirable). Recognition of the investor's need to predict the investee's capacity to pay returns to investors, on the other hand, provides a basis for choosing among alternative methods for measuring earnings (and assets and liabilities).
- (9) the investee's capacity to pay is dependent on its cash flows.
- (10) Evidence (indications) of the entity's future cash flows is the essence of accounting information that is useful in making investment decisions.

Measurement in accounting

A discussion of accounting measurement might reasonably commence with a careful analysis of the measurement process in general and then proceed to relate measurement to financial matters. Such an approach, however, does not seem appropriate in this study which attempts to present a set of broad, practical ideas about providing financial information useful to decision-makers. Indeed, even the term 'measurement' need not be adopted by the reader if he finds it distasteful; 'valuation' or 'quantification' may serve just as well. There appears to be little chance that an accountant will not recognize the problem discussed in this section under any of these labels. Specifically, it is the determination of the amounts of assets, liabilities, shareholders' equity and related items, and the expression of these amounts in numbers of monetary units – pounds in the United Kingdom.

A more controversial issue is: what is it about an asset (for example) that accountants should measure? An analogy may help to explain this issue. Imagine any physical object such as a piece of timber or steel. One could be concerned with measuring its weight in pounds if, for example, one were concerned with air transportation. Or one might be interested in its height, width, length or cubic volume under other circumstances. Other possibilities include measurements of hardness, ductility or some aspect of chemical composition. Weight, height, width, length, cubic volume, hardness, ductility and carbon content are *properties* of an object which are measurable and

are of concern in various circumstances. But what property of an asset is most frequently of concern to the users of financial statements? Its cost? Its market value one year ago? Its market value now? Or some other measure? The general type of answer that is consistent with the reasoning presented in the introduction is obvious: *the property of an asset that financial statement users would most like to know is its cash flow potential*. The same can be said of liabilities (which, of course, have negative cash flow potential). The cash flow potential of an asset or liability is its incremental effect on the present value of the firm's future cash flows. It encompasses both the times and the amounts of future cash movements resulting from the existence of the asset or liability. The justification for considering the item's incremental (or differential) effect and its present (or discounted) value will be provided later in the paper. We do not argue that cash flow potential is the *only* property of an asset or liability that anyone ever wants to have measured, but we do insist that it is the most commonly needed measure of an asset or liability. In fact, while several criteria must be met before an item can be classified as an asset, the one with which asset measurement is concerned, service potential, almost always means cash flow potential (in business enterprises). We expect no real detriment or error from disregarding such exceptions as noncash dividends.

At this point some comment is necessary on the use of alternative or substitute bases of measurement when direct measurement of the amount or value to be attributed to a particular item is not possible. If the accountant can measure future cash flows directly he is then measuring the property which decision-makers would most like to know.³ Typical examples of the use of this preferred method occur in the valuation or measurement of amounts due by or to an entity's debtors or creditors. However, if no direct evidence of the future cash flow to be yielded by an asset is available the accountant is faced with the choice of not measuring the asset at all or using a substitute or alternative measure, or a measurement of an alternative property, of the asset. The substitute selected, however, must have a demonstrable relationship to future cash flows. One good example of a substitute measurement for future cash flow is the use of current market value in the case of stocks. In contemporary accounting literature these alternative means of measurement are referred to as *surrogates*, and this term will be

used in this study. In addition to current market value, other surrogates for the unavailable measurement of cash flow which have been suggested are net realizable value, current replacement cost, historical cost and historical cost adjusted for the change in the purchasing power of the measuring unit (as indicated by a general price index).

Another analogy may illustrate the use of surrogate measurements. The road mileage between two cities normally differs from the air mileage, but a traveller may find one of these measures a useful surrogate for the other in some circumstances. Typically a surrogate is not a perfect substitute, and sometimes it may be so poor as to be useless, but often a surrogate measure (or measure of a surrogate property) is of some value to the user who is unable to obtain a direct measurement of the *principal* property called for by the decision situation.

Accountants measure assets and liabilities, both of which involve cash flow potential. The shareholders' equity is computed on the basis of previously determined amounts of assets and liabilities; it is the dependent member of the balance sheet equation. Changes in the shareholders' equity due to the operations of the firm consist of revenue, expenses, gains and losses; these are added and compared when calculating profit. Revenues are normally measured by measuring the amount of the asset (cash or a receivable) immediately after it comes into the business in the revenue transaction. By the rule of double-entry, the same amount is assigned to the credit entry to the revenue account, but it is the asset debit which is determined first. Similarly, debits to expense accounts are set equal to the independently measured credits to assets or liabilities. The amount of the entry is determined on the basis of the amount at which the outgoing asset was carried in the books immediately before its departure or the amount of the new liability immediately after its existence is recognized. In other words, 'flows' are not measured directly; their amounts are determined by measurements of 'stocks' of cash flow potential at two points in time. For this reason, the remainder of this paper will focus explicitly on the measurement of stocks (assets and liabilities); the determination of which flows should be included in the calculation of profit will be avoided in this paper.

Types of evidence of asset and liability amounts

While cash flow potential has been recognized as the principal property of both assets and liabilities, and the property which decision-makers most need to know, the terminology will now be revised to the more traditional focal points of accounting 'valuation' – assets

³In a more ultimate sense, cash flow potential is itself a surrogate for the utility to the investor of the goods purchased with the cash he will receive as a consequence of owning the security but the measurement problems associated with utility comparisons seem insurmountable.

and liabilities. This section is concerned with the nature of the available evidence of asset and liability amounts. The *existence* of the asset or liability is not an issue at this point; we are dealing with items which are assumed to have been identified as assets or liabilities. The question is: What types of evidence may be used as bases for the calculation of asset and liability amounts?

As noted in an earlier chapter, objectivity has always been sought by accountants. In particular, accountants prefer relatively objective, impersonal evidence as inputs to the accounting process. Kohler's *A Dictionary for Accountants* defines 'objective' as 'Having a meaning or application apart from the individual, or the peculiarities of his experience or of the environment . . .'⁴ Accountants are most reluctant to use their own judgments or those of entity personnel as starting points for the measurement of financial statement items, although they do make exceptions if the judgment comes from a skilled technician or professional such as an engineer. This reluctance, however, is not absolute; it does give way when the circumstances offer extremely unattractive alternatives. For example, the alternatives to accountants' judgments of bad debts are often so distasteful that accountants are willing to make their own judgments. Even in such cases, though, the accountant does seek objective evidence, such as the record of bad debt write-offs in previous years, as a starting point for his judgment. Exhibit 1 illustrates the most common types of objective evidence available to accountants as starting points for the determination of amounts of assets and liabilities.

A few explanatory comments may be helpful. The amount stated on the face of coins, currency, cheques and some types of notes and certificates is good evidence of their amounts. Contractual evidence may be found in documents, such as invoices, which describe some of the terms of explicit or implied contracts. Accountants typically are able to obtain contractual evidence of debtors and creditors, some other assets in the claims-to-cash category, and some other liabilities. Exit prices are prices in the market in which the entity would sell; entry prices are prices in the market in which it buys. These could be the same, as in the case of listed securities. The meanings of current prices, past prices and entity involvement seem clear. Historical cost, for example, is based on category III-B-2-a, past entry price in which the entity was involved. Bank statements and financial statements of 'investees' (for the equity method) are included in class V. Bad debts experience, plant

Exhibit 1. Types of Evidence of Asset and Liability Amounts

- I. Face or nominal amount
- II. Contractual evidence
- III. Market prices
 - A. Exit prices
 1. Current
 - a. Entity involved in establishing price
 - b. Entity not involved
 2. Past
 - a. Entity involved in establishing price
 - b. Entity not involved
 - B. Entry prices
 1. Current
 - a. Entity involved in establishing price
 - b. Entity not involved
 2. Past
 - a. Entity involved in establishing price
 - b. Entity not involved
 - C. Price indexes
 1. Specific (narrow) index (current entry prices)
 2. General (broad) measuring unit index
- IV. Physical observation and count of quantities
 - A. By entity personnel
 - B. By external personnel as reported to entity
- V. Records of other entities
- VI. Miscellaneous statistical evidence
 - A. Provided by entity personnel
 - B. From external sources

engineer's records of machine lives, and the unamortized cost of an asset for tax purposes are examples of evidence falling in category VI. While one might think of such documents as newspapers and vendors' price lists as categories of evidence, these are better regarded as media, or transmission devices, for evidence.

Another feature of this list may not be obvious. The categories of evidence listed not only provide the bases for the measurement of assets, but also cover liabilities. The basic evidence for the quantification of most liabilities falls into categories I and II, but market prices for goods and services are sometimes used, especially in connection with obligations to deliver goods or render services.

Measurement methods in accounting

In this section we shall discuss in some detail several measurement methods which are either commonly used in accounting practice or widely discussed in the literature and explain their relationship to this part of the study. They are all based on the types of evidence discussed in the preceding section. In each case we attempt to give sufficient explanation and justification for the method's use to make it a credible candidate for acceptance by the accounting profession,

⁴E. L. Kohler, *A Dictionary for Accountants*, 4th ed. (Prentice-Hall, Inc.; 1970).

but we do not recommend the use of any one method in particular circumstances nor do we intend, in this section, to indicate the superiority of any one method over any other. The term 'measurement' method is used to mean a procedure for utilizing one or more types of evidence in ascertaining the amount of an asset or liability or the change in the amount of an asset or a liability. The following descriptions are offered as a basis for the discussion in the remainder of the paper.

(a) *Face value*

This is the traditional basis for stating the amounts of coin, currency, cheques, drafts, money orders and a few other types of items which meet the criteria of cash on hand. It relies upon the nominal amount appearing on the object itself, the count by the person examining the objects and arithmetic operations.

(b) *Future cash flows*

Contractual evidence and documentary evidence from other entities are relied upon in calculating future cash flows. Future cash inflows from debtors are rights provided for in the contract of sale, whether written, oral or implied. Copies of internal documents, such as sales invoices, the contract itself (if written) and confirmations from debtors, are examples of evidence used by accountants to establish the amounts of claims against debtors. Similarly, obligations to trade creditors are measured by reference to purchase invoices, copies of internal documents and contracts. But in the case of debtors, the estimation of future cash flows requires that consideration be given to bad debts, or uncollectible accounts. The evidence used in estimating the provision for doubtful debts may be varied but often includes past write-offs, the credit ratings of customers, the age of outstanding balances and current macroeconomic statistics. The subjectivity of the process is undeniable but so is its relevance. The measurement of receivables and monetary obligations on the basis of future cash flows is possibly the oldest technique in accounting; indeed, the terms 'debit' and 'credit' are thought to have started their careers in accounting when, during the Renaissance, Genoese and Venetian merchants and bankers recorded the amounts owed to them by debtors and by them to creditors.

(c) *Discounted future cash flows*

Adjustments of future cash flows are sometimes made in order to obtain a better estimate of the present significance of the claims to cash. For example, future collection and book-keeping costs may be deducted from a sum of debtors made up of many

small amounts, especially if the payments are to be made over a long period. Similarly, receivables not due in the near future may be discounted for an interest, or cost of capital, factor, in order to recognize the difference in financial significance between a dollar due tomorrow and a dollar due a year hence. Material amounts of unearned interest are not included in the amounts at which long-term debtors, notes receivable and other debt instruments owned are shown in the accounts. Nor are material amounts of unaccrued interest shown as liabilities. For example, a 5-year, 8%, interest-bearing note with principal value of \$1,000 is a contract calling for a total of \$1,400 in cash. But it would be valued, at a balance date $4\frac{1}{2}$ years prior to maturity, at \$1,040 – as an asset on the holder's balance sheet and as a liability on the maker's statement. The use of money is viewed as a service rendered, over the period of the credit relationship, by the lender to the borrower. The lender does not record his revenue and receivable for this service until the service is rendered, and the borrower omits the expense and liability until the service is received. Partial performance is recorded in accordance with the accrual concept (of which accounting for interest is a prime example).

Measuring assets and liabilities on the basis of future cash flows less unaccrued interest is a universal practice if the interest rate is explicitly stated; the valuation principle involved is accepted by many accountants even in the absence of an explicitly stated rate or if the explicit rate is out of line with current market rates for similar credit arrangements. We shall use the term 'discounted future cash flows' to apply to anticipated future cash receipts and disbursements net of an interest allowance for the waiting period, whether the computation is made by simple deduction or by the calculation of true present value based on a discount factor, and regardless of the explicitness of the interest (discount) rate. The discounted (present) value of a future cash flow is the amount which, with the addition of compound interest, will grow to the maturity amount or amounts at the future payment date or dates. We do not, of course, visualize the application of the discounted future cash flow method to any asset or liability except those providing contractual evidence of future cash flows.

* * *

A short digression on the concept of discounted value may be useful at this point. The main idea in the concept of capital value is that the value of any asset is the present value of all future benefits obtainable from it, discounted at the required rate of return. This viewpoint now permeates the thinking of the

professional investors in the financial centres of the world, and has been generally accepted in the academic literature of finance for at least several decades. Perhaps the most frequently quoted work is John Burr Williams, *The Theory of Investment Value* (Harvard University Press; 1928). He defines investment value 'as the present worth of the future dividends in the case of a stock' (p. 6). Earlier, Robert F. Wiese, 'Investing for True Values', *Barron's*, September 8, 1930, p. 5, had written: 'The proper price of any security . . . is the sum of all future income payments discounted at the current rate of interest in order to arrive at the present value.'

These writers probably would not want to take much credit for the present value concept of securities value, for they undoubtedly were familiar with the writings of Irving Fisher, who, in *The Nature of Capital and Income* (The MacMillan Company; 1906), p. 223, concluded ' . . . that the value of any capital-good, either of wealth or of property-rights, assuming that all future income is foreknown, is the discounted value of that income'. Fisher, in turn, must have been acquainted with the views of Bohm-Bawerk. 'A material service, which, technically, is exactly the same as a service of this year, but which cannot be rendered before next year, is worth a little less than this year's service; another similar service, but obtainable only after two years, is, again, a little less valuable, and so on, the value of the remote services decreasing with the remoteness of the period at which they can be rendered. Say that this year's service is worth 100, then next year's service – assuming a difference of 5 per cent per annum – is worth in today's valuation only 95.23; the third year's service is worth only 90.70; the fourth year's service, 86.38; the fifth, sixth, seventh year's services, respectively, worth 82.27, 78.35, 74.62 of present money . . . That the figures should alter according as the date of the valuation stands nearer or farther from the date of obtaining the utility, is an entirely natural thing, and one quite familiar in financial life. The value of paper – which is just a 'durable good' with annual uses – always stands a little higher shortly before the interest 'or dividend terms than some time before. I may note that the above figures are taken as before from Spitzer's Tables, and are based on an interest rate of 5 per cent.' (Eugene von Bohm-Bawerk, *The Positive Theory of Capital*, trans. William Smart (New York, G. E. Stechert and Co., 1891), pp. 342–3 (italics added).)

The valuation of financial claims by discounting the future cash flows they promise, with the aid of present value tables, was a common practice in the time of Bohm-Bawerk and Simon Spitzer, whose first edition of interest tables appears to have been

published in 1865 in Germany. Spitzer, however, did not have to make all the computations himself; many earlier volumes were available to him, especially in English. For example, Sir Isaac Newton's, *Tables for Renewing and Purchasing the Leases of Cathedral-Churches and Colleges*, was originally published in London in 1686, and that edition (which was followed by many more) included present value of annuity and related tables, as did John Playford's, *Vade Mecum, or the Necessary Companion*, the third edition of which was published in London in 1683. This pocket-sized manual included such handy tables as weights and measures, world coin equivalents multiplication tables showing the products of unit prices and quantities, post rates, and fares of coachmen, carmen and watermen, and it was therefore obviously intended for the daily use of London merchants; the inclusion of present value tables strongly implies that they were considered relevant to the business affairs of seventeenth century England. Professor Robert Parker has traced compound interest and present value tables to Simon Stevin (Antwerp, 1582), Jean Trenchant (Lyons, 1558), and Pegolotti (Florence, 1340). (See R. H. Parker, *Management Accounting: an Historical Perspective* (MacMillan; 1969).) This background suggests that the present worth concept of asset value is a practical approach of long standing.

Jumping from the fourteenth century to the twentieth, we note that the discounted value concept also has direct application in current accounting practices; six Opinions of the Accounting Principles Board in the United States have required use of present values in the measurements of assets or liabilities. These include the 1971 Opinion on 'Interest on Receivables and Payables' which recognized the general idea that future cash flows must be discounted even if an 'imputed' rate must be selected because of the lack of a reasonable explicit rate.

* * *

(d) *Net realizable value*

We shall use this term to mean a current valuation (at the balance sheet date) based on the *current* price at which the asset could be sold less the costs of selling and collecting the sales price. (While the term 'net realizable value' is sometimes used to mean estimated *future* net proceeds from disposing of an asset, we must classify such a procedure as a version of the future cash flow method of measurement.) Net realizable value is based on the price in the market in which the firm would normally sell the asset (an exit price) and on the current entry prices of the commodities and services which must be consumed

in making the sale, delivering, collecting, etc. In order to minimize the possibility of misinterpretation, we should emphasize the wide variation in availability of clear-cut current market prices and in difficulties encountered in estimating the remaining costs to be deducted. Such problems result in variations in the reliability of measurements of net realizable value in different circumstances.

Net realizable value is a widely-used measurement method, especially in conjunction with historical cost in the traditional approach to the measurement of current assets at the lower of cost and market and in the writedown of obsolete noncurrent assets. (Note, however, that market in the phase 'lower of cost and market' often means replacement cost rather than net realizable value.) Net realizable value is also commonly applied to the finished stocks of some industries, especially in nonferrous metals and agriculture, without consideration of cost. The prevalence of these practices suggests that accountants are familiar with the concept of net realizable value, and have a good deal of experience with its application.

Liabilities can be measured at negative net realizable value. If net realizable value (the net effect which the current liquidation of an asset would have on the firm's cash balance) is sometimes an appropriate measure of assets, then the net effect which the current liquidation of a liability would have on the firm's cash balance may also be an appropriate measure of a liability in some cases. For example, an obligation to deliver certain merchandise or other stocks could be measured by the cash outlay, including fringe costs, that would be required at balance date to acquire and deliver the goods.

One of the most significant potential applications of net realizable value is to a finished stock of a commodity for which an independent market price quotation is regularly available. The availability of such a quotation permits the accountant to measure output at market value without waiting for a sale, thus recording the management's accomplishment in the production area in the period of production rather than in the period of sale. The impact of this method on periodic profit or loss can be taken into account most simply by adjusting the closing stock of the commodity to net realizable value, if the firm uses a cost accounting system that includes a finished stock account at cost, or setting up closing stock at net realizable value if no cost accounting system is in use. In either case the credit would be to the main revenue account which includes sales for the year; the sum, less the net realizable value of the beginning stock, would be shown in the profit and loss account as the market value of the year's output.

But if the accountant prefers to use the net realizable

value method in a manner which distinguishes between revenue from production and holding gains and losses, and if a 'perpetual', i.e., up-to-date, stock accounting system is used, a set of entries along the following lines would be appropriate:

| | | |
|--|------|---|
| Dr. Cost of (name of product, e.g., copper) produced | X | |
| Cr. Work in progress | | X |
| To record cost of product completed. | | |
| Dr. Finished stock | X | |
| Cr. Market value of copper produced | | X |
| To record value of output | | |
| Dr. Trade debtors | X | |
| Dr. or Cr. Loss or gain on holding copper stocks | X or | X |
| Cr. Finished stock | | X |
| To record sale of copper and difference between market price when produced and sale price. | | |

In practice this last entry would probably exclude the gain or loss, and credit would be taken to the finished stock account for the selling price. In these circumstances whatever adjustment was required at the end of the period to state the closing stock at market value would automatically record the net holding gain or loss for the period. For example, if prices have been rising during the period, sales would result in crediting the finished stock account with prices higher than those at which the product was charged to finished stock, so a debit adjustment of the finished stock account, offset by a credit to 'gain on holding copper stocks' account, would be in order. The cost of copper produced would be deducted from the market value of output in the profit and loss account. The holding gain or loss would be shown separately. Shipping and other post-production costs could be charged to expense as incurred, except for the estimated costs of disposing of the closing stock; they could be recorded by crediting a contra stock account as follows:

| | | |
|---|---|---|
| Dr. Shipping expenses | X | |
| Cr. Finished stock - provision for future costs | | X |
| To provide for remaining costs of disposing of closing stock. | | |

This leaves closing stock at net realizable value, and the estimated post-production costs (e.g., shipping) are matched with the market value of the output

for the period. The profit and loss account reflects the profit or loss from producing a saleable commodity, as well as the net gain or loss resulting from holding stocks of the product while the market fluctuates. This separation may give the reader a better basis for predicting future results.

(e) *Replacement cost*

The current entry price of an asset, including fringe acquisition costs such as transportation and commissions, is a widely-used measurement method, especially as an expression of 'market' in the lower of cost and market method. It is also applied to long-life assets, especially through the use of specific indexes of the prices of narrow categories of fixed assets. Some of those firms that make occasional revaluations of long-term assets also use the replacement cost version of current value.

Replacement cost differs from net realizable value by being based on the market in which the firm buys, e.g. the wholesale market, whereas net realizable value is based on the market in which the firm sells, e.g. the retail market. Even if the two markets are the same, e.g. the listed share market, replacement cost technically includes the fringe costs of acquisition as an addition to market price, whereas net realizable value is market price less selling costs such as commissions. The spread between replacement cost and net realizable value in the one-market case can be substantial for some types of assets.

The value of limited-life long-term assets which decline in service potential must be reduced by amortization (a term used here to include depreciation in the case of tangible assets). Replacement cost less amortization is not, however, listed as a separate measurement method, as the basic replacement cost method is regarded as being applicable to the remaining stock of services embodied in a fixed asset; such application typically requires determination of replacement cost new and the portion of the original package of services that remains available to contribute to future cash flows of the firm.

The additional entries required to account for assets at replacement cost are very simple. In fact, if replacement cost is used as the sole valuation of an asset (with no retention of historical cost data for some purposes), the only special entry would be a debit or credit to the asset to adjust it to the current replacement cost, an adjustment of the accumulated depreciation account by the same percentage but in the opposite direction and a credit or debit to a holding gain or loss account for the difference. Subsequent entries to record the consumption or sale of the asset (including depreciation of

fixed assets) would be based on the revised asset amount. If, on the other hand, cost data must continue to be provided for some purposes, the revaluation entry would require special asset and accumulated depreciation accounts for the difference between cost and replacement cost. In those firms in which some depreciation and consumption of materials and supplies are charged to work-in-progress and finished stock, maintenance of these latter accounts on two bases would be somewhat more difficult, but basic replacement cost records could be adjusted to an historical cost basis with acceptable accuracy by the application of estimating techniques which would not require detailed cost-based records.

Finally, we should mention that the counterpart of replacement cost, perhaps it should be called negative replacement cost, or replacement receipt, may be considered applicable to liabilities which involve obligations to deliver commodities or services. If, for example, a liability has been established at the selling price of goods but the selling price changes before the goods are delivered, the liability could be adjusted to the current selling price of the goods, just as an asset could be adjusted to the current buying price of the goods - replacement cost. Note that we are not necessarily recommending this practice; we are only describing it in order to provide a more complete coverage of measurement methods which could be applied to liabilities.

(f) *Market price*

Assets are sometimes shown at market price without any addition of fringe acquisition costs or deduction of selling costs. This method is frequently applied to securities owned; it could also be applied to debt securities included among liabilities. When changes in market prices are recorded, the offsetting entry is made in a holding gain or loss account.

(g) *Historical cost*

This is a past entry price in which the firm was involved (category III-B-2-a in Exhibit 1). As a type of market price, it reflects the market's judgment of the asset's cash flow potential, in a general sense, at the date of the transaction. Sellers at that price believe the asset has no greater cash flow potential to them; buyers at that price believe the asset has a cash flow potential to them of not less than the market price. In particular, the acquisition price reflects the judgment of the management of the buying firm that the asset is worth at least its cost in the use visualized at the time of acquisition. Historical cost includes any fringe costs of acquisition.

Amortization (or depreciation) of the historical cost of limited-life assets which decline in service potential

is commonly practised in order to value the asset at the cost of the remaining stock of services.

The counterpart of historical cost (historical receipt?) is often applied to liabilities. For example, nonmonetary liabilities such as obligations to deliver goods, provide the use of property, or provide insurance protection to a customer, tenant or policyholder may be measured by reference to the amount of money which was received, for the goods or services remaining to be provided when the liability was established.

(h) *Adjusted historical cost*

This term is used to mean original cost adjusted for the change in the purchasing power of the monetary measuring unit as measured by the change in a general price index between the asset's acquisition date and the balance date. The justification for this method lies in the assumption that a reader of financial statements has a clearer impression of the significance of the current pound in terms of the purchasing power it represents than he has of any other pound. If so, the amount of the sacrifice that was made to acquire an asset can best be conveyed to the reader if that sacrifice (cost) is expressed in terms of the number of 'current' pounds that have the same purchasing power significance as the number of 'acquisition date' pounds which were paid for the asset. This means that historical cost stated in current pounds is viewed as a more accurate expression of the sacrifice made to acquire the asset than historical cost stated in pounds used at an earlier date. Adjusted historical cost is a version of cost; it is not a current value or 'fair value' method. It is subject to amortization in the same circumstances as historical cost. Its mirror image (adjusted historical receipt) could be applied to nonmonetary liabilities. Adjusted historical cost is recorded in the accounts by an entry in the asset and accumulated depreciation account and an offsetting entry to a special shareholders' equity account which is not considered to be a profit and loss item. Aside from this difference, the above comments pertaining to the recording of replacement cost apply also to adjusted historical cost.⁵

(i) *Equity method*

Two versions of the equity method may be described. The *pure equity method* of asset measurement means showing securities owned, generally ordinary shares, at their 'book value' as reflected in the balance sheet of the issuing company (the

investee). The *cost-based equity method* begins with the historical cost of the shares when acquired by the owner and then adjusts for all subsequent changes in their book value as reported in the financial statements of the investee but any acquisition-date discrepancy between investor and investee valuations is preserved. Variations are often applied for the sake of conservatism, or to make the income effects more consistent with the income that would be shown if the investee's accounts had been consolidated with those of the investor. Both versions of the equity method result in the investor reporting its share of the investee's earnings or losses in its own profit and loss account while dividends received are treated as reductions in the asset.

The equity method is supported on the grounds that it is the only way of accounting for the investor's interest in the investee that does not conflict with the investee's accounting. If the investee's accounts present a true and fair view of its state of affairs and profit or loss, one could question any method of accounting for the investment which conflicts with those accounts. The cost-based equity method is, from this point of view, a compromise in that it only utilizes the investee's profit and loss account and not its balance sheet. This discrepancy opens the cost-based equity method to the criticism that cost may be greater than book value at acquisition date because the investor anticipates, and pays for, future earnings in excess of a normal rate of return on book value; if these earnings are then added to the investment account when they appear, they are double-counted. Perhaps the cost-based equity method could be revised to meet this criticism.

* * *

We have described nine methods of measuring assets and liabilities. It should be clear that we are not recommending any one of these methods for application to all assets and liabilities. Consequently, balance sheets include amounts determined in several different ways. We see no prospects for a change in this state of affairs, except with respect to the relative popularity of the methods. In this section we have not expressed a preference for any method but have tried to make the case for each method. In the next section we shall appraise these nine measurement methods by reference to our first criterion of useful financial information – relevance to the decisions of users.

Evaluation and ranking of measurement methods on the basis of the relevance criterion

We have now reached the stage in our analysis where we can begin to apply the criteria of useful informa-

⁵For further analysis of the recording of price changes and price level changes, see George J. Staibus, *A Theory of Accounting to Investors* (University of California Press; 1961 and Scholars Book Co; 1971), pp. 116–127.



tion which we suggested in the introduction. We have chosen to commence with the criterion of relevance to the decisions of users, because it is most closely tied to the decision-useful approach and it can be dealt with on a general level rather than in the light of the circumstances of a specific case. Subject to some variations when applied to different categories of assets and liabilities, we are able to rank the measurement methods in order of their inherent relevance to the cash-flow-oriented decisions of users. We urge the reader to keep in mind that these rankings do not constitute recommendations for use of the high-ranking measurement methods, because the methods are ranked only on the basis of relevance; consideration of other criteria may result in substantially different rankings of usefulness in particular cases.

The present analysis is built on the previously stated position that users of published financial statements have a greater need for information about the firm's future cash flows and present cash resources than for any other category of information. The positive or negative cash flow potential of an asset or liability is the property we are trying to measure, but measurements of surrogates for this property are often necessary because of our inability to obtain direct evidence of future cash flows. In this section much of the analysis is aimed at appraising the relative quality of alternative surrogates for future cash flows.

The first method to be discussed is use of the *face value of cash on hand*. While we are aware of imperfections in this method (e.g., counterfeit money, inflation before spending), we do not believe we can justify taking the reader's time with a discussion of them. Instead, we assume that it is acceptable to rank this method at the top of the list.

The first substantive issue of this section then becomes: Do future cash flows (receipts and disbursements) need to be discounted? If we have solid evidence that a debtor is going to pay the firm £1,000 one year from the balance date, does the £1,000 need to be discounted, or reduced by unearned interest, in obtaining the amount to be shown as an asset? Inflation apart, is £1,000 to be received one year from now as large an asset as £1,000 to be received tomorrow? We believe that most businessmen and accountants would give a negative response to this last question. One thousand pounds to be received tomorrow and £1,000 to be received a year hence are not equal and do not add to £2,000 of assets. No practical businessman or investor would be willing to pay the same amount for these two assets; he would not like to base an investment decision on a balance sheet that includes them both at maturity values. We all know that the £1,000 to be received tomorrow could be invested to mature to a sum greater than

£1,000 one year hence, and it is therefore a preferable asset. Similarly, £1,000 due tomorrow is a more burdensome obligation than £1,000 due a year hence. Accounting practices which ignore such differences do not measure up to the relevance criterion. The discounted future cash flow method yields more relevant information than the undiscounted future cash flow method.

At this point several warnings may be appropriate. One is that the test of materiality may indicate the acceptability of either the future cash flow measure or the discounted future cash flow measure in cases in which there is some consideration that favours the former, e.g., the cost of calculating the discount or difficulties in agreeing on the appropriate discount rate. We should also remind the reader that both of these measures require objective evidence of future cash flows; if that evidence is lacking a surrogate measure, should be chosen. We certainly do not want to encourage accountants to guess at future selling dates and prices of stocks on hand and include those stocks on the balance sheet on that basis. Fixed assets are even further removed from the direct cash flow measurement picture. On the other hand, it is possible that a stock of merchandise or finished goods on hand is covered by a contract to sell which does provide reliable evidence of a future cash flow. Similarly, a lease contract might, in some circumstances, provide sufficient basis for measuring machinery or even real property on a discounted future cash flow basis. But direct measurement of assets and liabilities on the basis of future cash flows must generally be limited to monetary assets and monetary liabilities – cash and claims to cash, or an obligation to pay cash. Non-monetary assets which are expected to contribute to future cash flows through the operating cycle – conversion to saleable goods or services, to debtors, and then to cash – are unlikely to be measured on a cash flow basis even if the selling price of the product is 'assured', because the portion of that selling price attributable to the particular input under examination – a raw material, an item of supplies, a machine – can not be determined in any objective and defensible way. This 'allocation problem', as it is often called, is in the present context a weakness in the *reliability* of the discounted future cash flow method; the information would be *relevant* to decisions if a reliable measurement could be made.

The remainder of the measurement methods may be analysed more effectively if we divide the subject matter – assets other than cash and debtors, and liabilities – into four categories on the basis of their future roles in the firm:

1. Assets held for *sale* in their present form.

2. Assets held for *use* as inputs to production processes or for use in operations.
3. Assets held as *investments* to yield income and or appreciation.
4. Liabilities.

This classification scheme, like most, can not be utilized without encountering some difficulties. To a large extent the classes reflect management intentions or commitments. The sell-or-hold decision regarding a particular asset does not appear to receive the continuous attention of managers. Class one includes those assets which the management does have marked for sale. Class two assets are marked to be held for use although some of them may be close to the marked-for-sale category. Class three includes both temporary and long-term investments.

Our analysis of the measurement of these classes of assets and liabilities will be based on the incremental approach to value. The cash flow potential, or value, of one unit of an asset is viewed as the difference between the value of the firm when the unit in question is included and the firm's value when that unit is excluded. We shall consistently focus on the question: 'What difference would it make to the firm if one unit of this asset (out of several on hand) disappeared (with sufficient notice to permit the most economical adjustment)?' In taking this approach, we realize that the sum of the individual asset values does not yield the overall value of the firm. This is unfortunate, from the standpoint of investors, but a reliable measurement of the value of the firm is simply out of reach of accountants at the present time, although they can help investors in their inevitable quest for this information. Accountants must work with specific asset units – a machine, a square metre of material, a building – not with the production facilities of a company in one location or the value of a division of a company. In view of accountants' great respect for, and necessary dependence upon, market prices as evidence of value, their first choice of evidence of the value of the whole firm would have to be the market price of its shares (if available). However, investors are not likely to be willing to pay accountants much for that information. So we must concentrate on the incremental values of individual assets of sizes which are commonly bought and sold. The failure of the sum to represent a measure of the value of the whole firm is a limitation of accounting which we do not know how to overcome.

(i) *Assets held for sale*

We begin with the proposition that users of financial statements would prefer to know the discounted net cash receipt that will result from the disposition of an

asset. In the absence of reliable direct evidence of future cash receipt, the cash receipt that could be enjoyed at the balance sheet date is a useful surrogate. The quoted price in the exit market on the balance date, less the prices (in the entry market) of whatever services or commodities are needed to sell the asset, i.e., *net realizable value*, is, in many cases, a good surrogate for the discounted future cash flow that will result from the disposition of the asset. A better understanding of the potential role of this measurement method may be gained if we take note of its possible weaknesses. First, we may not be able to identify the one, clear-cut, objective, independent market quotation. Many securities, basic products of mines, the sea and the land, and standard, graded manufactured products are traded in markets which provide quotations meeting the accountant's reliability and neutrality standards, but many assets in the categories of plant, work in progress and finished stocks of branded, technical and fashion goods do not. But the weakness of net realizable value in the latter cases must not be used as an excuse for not applying it in some of the former cases. Accountants must take the responsibility of selecting the most appropriate method to use consistently in the particular case – one type of asset in one firm. The inappropriateness of that method in other cases is irrelevant, except to the extent that comparability must be considered as *one* criterion of useful information. (Comparability, however, does not require the same treatment of items in significantly different circumstances.)

Other possible weaknesses in net realizable value as a surrogate for discounted future cash flow are changes in the market price between the measurement date and the sale date, a change in the management's plans for sale, and errors in the calculation of the costs to be deducted from current selling price to obtain net realizable value. These potential weaknesses, or defects, clearly apply unevenly to different assets. The professional judgment of the individual accountant, or of the group of accountants concerned with a particular industry, or of the accounting profession as a whole, must be utilized to discriminate between those cases in which the weaknesses are disabling and those in which they are only imperfections.

The *market value* of an asset, without any deduction for costs of selling or addition of fringe acquisition costs, may relate to either a market in which the firm buys or one in which it sells. It would appear to be a good surrogate for net realizable value if the necessary selling costs are immaterial. It can be used by securities dealers and speculative investors in various assets.

Current replacement cost may be a good surrogate for the net realizable value of assets held for sale. The justification for this assertion lies in one of the most

generally accepted ideas in economics: the selling price of an article tends to cover its full economic costs, including a return on capital. This tells us that there is a relationship between net realizable value and replacement cost. But we know that this relationship is a fairly general one; it may not be very close for any one commodity at any one time. The competitiveness of the industry and other factors can result in substantial differences. Furthermore, the problems of ascertaining the full and current cost of producing or acquiring any asset, including incremental administrative and overhead costs and cost of capital, are often formidable. As a consequence, we are forced to recognize that the suitability of replacement cost as a surrogate for net realizable value is seriously impaired in many cases. But, again, we insist that its unsuitability in some cases need not preclude its use in other cases in which its limitations are minor compared with those of alternative methods.

Historical cost. If it is accepted that:

- (a) net realizable value can be justified as providing evidence of future cash flows on the basis that current selling price is a good surrogate for future selling price, and
- (b) replacement cost can be justified as a surrogate for net realizable value, and
- (c) historical cost can be a reasonable surrogate for replacement cost,

it follows that historical cost may, in some circumstances, be a surrogate (albeit twice removed) for future cash flow potential.

That historical cost can be a reasonable surrogate for replacement cost may be explained as follows: the major difference is in the date of the market price involved, and there is a high statistical correlation between the prices of a sample of goods at one date and the prices of that same set of goods at another date not far removed from the first. This association links historical cost to replacement cost, which has already been linked to net realizable value, which is a surrogate for discounted future cash flows.

Historical cost is sometimes justified on another, more subjective, basis. It represented, at acquisition date, a minimum judgment by the management of the value of the asset's contribution to the firm's future cash flows. One could argue that this interpretation of historical cost emphasizes its relevance to the circumstances of the particular firm because the firm's own management – not just other buyers and sellers – participated in the establishment of the price. While this view gives some support for the *relevance* of

historical cost to decisions that call for discounted future cash flows, it does not provide much support for the *objectivity* of historical cost. Indeed, to the extent that accountants are reluctant to rely upon values based on the opinions of entity personnel, but respect independent market prices, historical cost could be criticized for lack of objectivity. However, we rate it higher by our reliability criterion because reliability is a substantially different concept from objectivity. This discussion will be resumed in the next section of this paper.

Before leaving historical cost, a word should be said about differences in the circumstances surrounding the acquisition of an asset. One difference is between an asset which was acquired in substantially its present form for an agreed price, as opposed to an asset which was constructed, manufactured or otherwise assembled from a combination of separately acquired and independently priced inputs. The cost of assets in the first category typically represents a more objective market evaluation because other buyers and sellers probably were involved, in some sense, in the market for that particular form of asset. A 'self-constructed' asset which is unique has not been appraised as a unit; only the firm's management has judged that the asset will be worth, when completed, at least its estimated cost. The actual acquisition cost would appear to be a less relevant measure of cash flow potential in the latter case. This case also suggests another difference in circumstances of acquisition. This is the difference between expected costs and realized costs. Only the former can be viewed as included in management's minimum judgment of the value of the new asset. Actual historical cost of internally assembled assets does not seem to warrant as much support on the management judgment basis as (1) the estimate of cost on which the judgment was made or (2) actual historical cost in 'simple purchase' acquisitions. These considerations appear to detract from the merits of historical cost and adjusted historical cost of such possible assets as capitalized research, development and exploration costs, other self-developed intangibles and, to a lesser extent, self-constructed plant assets, work in progress and finished stocks. We are not suggesting that these items should not be measured at cost, but we do suggest that this possible weakness be considered before selecting the historical cost method for use in such cases. In this context, standard cost appears to have considerable merit, where applicable.

Adjusted historical cost is a version of historical cost which appears to be a better surrogate for replacement cost than historical cost expressed in the measuring unit in effect at the acquisition date. Consider this example: Item x was purchased ten years ago for

£300. A general price index representing prices in the entire economy has risen 50% since then. What is the best guess of the current price of x , if one does not know the nature of x ? Since most prices have risen and the average rise has been 50%, an estimate of £450 would appear to be a safer estimate than £300. For this reason we rank adjusted historical cost over original historical cost as a surrogate for replacement cost.

(ii) *Assets held for use*

Under this caption we usually find raw materials to be used in production, supplies of various sorts, and limited-life plant assets such as machinery and buildings. The critical practical limitation is the absence of direct evidence of the contributions these assets will make to the firm's future cash flows. This circumstance again forces accountants to turn to surrogates for direct measurement of future cash flows.

Using the incremental test of asset value, the most useful question to ask appears to be: What difference would it make to the firm's future cash flows if a unit of the asset disappeared? This question can not be answered without knowing what noncash events would be different. There are three major possibilities:

- I. A change in quantity on hand may result in a change in future acquisitions:
 - (A) By purchase, if the asset is normally acquired in its existing form.
 - (B) By production, if the asset is of a type that is produced within the firm.
- II. A change in quantity on hand could result in a change in future usage of the asset (resource) in production:
 - (A) Change usage by changing the output of the firm's product.
 - (B) Change usage by substitution of this resource for another or vice versa.
- III. Change the direct sales of the asset itself – if it is held for use but is effectively obsolete from the point of view of the firm and its present activities, so is available for sale. (For example, machinery which is in use but is not up-to-date and therefore would not be replaced if it became unserviceable; or a stock of material which was purchased for other circumstances but is being 'used up' because it is on hand.)

These possible consequences of changes in the quantity of an asset on hand may be associated with measures of assets as follows:

- I. If one less unit on hand means that the firm

must acquire one more unit in the future, then the presence of a unit of the asset saves the firm the future incremental acquisition cost (by purchase or production) of a unit. Current replacement cost is a reasonable surrogate for future acquisition cost.

- II. (A) If the incremental asset affects future output and sales, then the financial consequence of its disappearance would be the change in the future sales of the final product, less the saving by not incurring the cost of other resources used to make the product. This could be called 'net, net realizable value' in order to indicate that it is, in principle, the same as selling price less remaining costs, but that the remaining costs are so substantial that estimating them would be hazardous. Furthermore, deducting the cost of the other resources from the selling price of the product attributes the entire profit or loss on the product to the one resource in question. If this measurement method were applied to each of the resources in turn, the sum of the values could not be expected to approximate the value of the product. Net realizable value is subject to this conceptual weakness which becomes particularly important when the asset being measured is materially complemented by other resources.
- (B) If the availability of one less unit of the asset would require the consumption of more of another resource (which assumes substitutability), then the significance of a unit of the asset would be measurable by the cost of the substitute.
- III. In the case of the 'obsolete' asset, a change in the quantity on hand presumably would not affect future acquisitions of the same type of asset, but might well affect the future sales of retired or unneeded assets. The present net realizable value of such assets appears to be a better indicator of their current significance to the firm.

The preceding analysis is summarized in Exhibit 2 for ready reference. The next step is to take into consideration the probability of each of the possible responses to a change in the stock of the asset in order to reach conclusions about the applicability of the various measurement methods under discussion in this chapter to assets held for use. Experience suggests that the first listed response – change in future acqui-

Exhibit 2. Application of the Incremental Test of Asset Value to Assets Held for Use

| Difference in Actions | Financial Consequences | Relevant Surrogate Measure |
|--------------------------------------|--|--|
| I. Change future acquisitions | | |
| (A) By purchase | Change future purchase costs | Current replacement cost by purchase |
| (B) By production | Change future production costs | Current replacement cost by production |
| II. Change usage | | |
| (A) Change output of product | Change future receipts and costs of other inputs | Net, net realizable value |
| (B) Change other (substitute) inputs | Change in cost of substitute | Current replacement cost of substitute |
| III. Change direct sales of asset | Change future receipts and selling costs | Present net realizable value |

sitions – is by far the most frequent one. Response II(A) – change in output and sales – probably occurs occasionally, but the presence of stocks of the asset itself and of assets in later stages of the production cycle typically prevent a small change in the quantity of an asset on hand from affecting sales of the firm's product and the cash receipts that follow sales. Response II(B) may be more likely but probably does not happen in more than a small minority of cases. Response III is only relevant to assets which are not considered up-to-date for the firm's purposes, i.e., 'obsolete' assets.

We conclude that (1) obsolete assets held for use may be relevantly measured at net realizable value; (2) 'net, net realizable value' and current replacement cost of a substitute are only occasionally relevant measures of assets held for use – a fortunate situation in view of their apparent weakness on the reliability criterion – and (3) replacement cost is by far the most frequently relevant measure of assets held for use. Our emphasis on replacement cost is, we believe, consistent with the experience of the average businessman. With respect to most assets held for use, the greater the stock on hand, the smaller the quantity to be purchased in the future. Every unit on hand saves the firm a future cash outflow in the amount of future replacement cost, and present replacement cost appears to be the best surrogate for future replacement cost. On this basis, *we conclude that replacement cost is the most frequently relevant measure of up-to-date assets held for use.*

This conclusion is based on the incremental test of asset value applied to normal circumstances. It is not based on such tests as: What would a motorist pay for a tyre if he were stranded in the desert? Or, what would a manager pay for a unit of material if his entire

stock suddenly disappeared so that his production line must be closed down? Or, what would a manager pay for a new conveyor belt which is necessary to permit his plant to operate? These are not normal valuation situations. While assets may be 'worth' many times their replacement cost in emergencies, we believe the typical significance of an asset held for use is that it saves its owner its future acquisition cost. Replacement cost is the obvious surrogate for future acquisition cost.

Once we have accepted replacement cost as the most relevant of the available measures of up-to-date assets held for use, the ranking of the other methods follows from the analysis of the previous section. The best surrogates for replacement cost (including fringe costs) are simple market value excluding fringe costs, and net realizable value (providing it is not in the scrap market). Adjusted historical cost and historical cost can be justified as surrogates for replacement cost on the basis discussed in the preceding section.

The use of replacement cost as a measure of assets held for use results in the recording of unrealized holding gains and losses, as described in the preceding section of this paper, and provides for charging the *cost of using resources* to operations on a current basis. Historical cost accounting for assets held while their prices change involves charging operations for the *cost of acquiring resources* rather than the cost of using them, so does not provide the information needed by managers for deciding how to accomplish their objectives, that is, what combination of resources to utilize. If, for example, materials were purchased when the price was £3 per pound but the price is now £4 per pound, and if the management is making a decision involving alternative courses of action which would require different quantities of this material, the current cost of using this item (in accordance with the preceding analysis) is £4, and the wrong decision could be made if this figure is not used. An accounting system which routinely records the current cost of using resources appears to provide a better basis for managerial decisions than does a system based on historical cost. While these comments on the relevance, to management decisions, of replacement cost measurement of assets consumed may be viewed as a digression in a study on external reporting, the criterion of comparability of before-the-event calculations (by management) and after-the-event reporting (to both management and external parties), as mentioned in subparagraph (2)(c) of the introduction, requires that priority be given, other things remaining equal, to external reporting practices which are consistent with managerial decision-making practices. The current replacement cost measure of the cost of using assets which are held for use and will be replaced when used

seems to meet this criterion.

(iii) *Assets held as investments*

This category includes debt securities, shares, real property and personal property (such as art objects) which are held for regular income and/or capital appreciation. Direct contractual evidence of future cash flows is normally available for debt securities. These flows can be discounted at the appropriate current market rate of interest in order to measure the asset by the preferred method – discounted future cash flows. Current market value is an alternative which appears to be a second choice until we recognize that discounting at the current market rate of interest yields a result that is identical with current market value, since the yield rate which active buyers and sellers of securities use to calculate the price at which they are willing to buy or sell is the market rate of interest at the time. Thus, as a practical matter, we may speak of the valuation of debt securities at market value without departing from the discounted future cash flow goal.

Direct evidence of future cash flows from ordinary shares is not available, so market value would be the most relevant measurement method practically available for application to such assets. Net realizable value (market price less commission), and replacement cost (market price plus commission), do not appear to be as good surrogates for discounted future cash flows as the price which buyers and sellers set as the estimated present value of the future cash flows to be enjoyed by the owner of the shares. But replacement cost may have a role in the valuation of real property investments; one version of professional appraisals of buildings is 'replacement cost new', from which depreciation is then deducted. So replacement cost may be ranked immediately after market value for application to investments.

Historical cost has the same basis for use as a surrogate for discounted future cash flows from investments as it has with assets held for sale. Similarly, historical cost adjusted by a general price index has the usual advantage over historical cost. This brings us to another method that is related to historical cost and which is applicable to shares owned – the equity method. The justification for its application – in either of two versions – was given in a previous section of this paper and so will not be repeated here. We must recognize it as a method which takes into account changes in the value of the investment, as measured on the books of the issuing company (the investee) since acquisition date. This updating procedure results in a measure that is more future-oriented than is historical cost, so would appear to be a better surrogate for discounted future cash flows and more relevant to

decisions regarding investments in the company owning the shares. We, therefore, rank it ahead of historical cost and adjusted historical cost, but behind current market value in typical circumstances.

(iv) *Liabilities*

The measurement of liabilities typically is perceived as a less difficult problem than the measurement of assets. While the average accountant may not express it as we do in this study, we believe this is because direct evidence of future cash flows is available for the great majority of liabilities. This permits accountants to show liabilities at the sum of the future cash payments called for in the contract, less unearned interest, i.e., at discounted future cash flows, or alternatively, at undiscounted future cash flows, if discount is immaterial because the payment date is near at hand. The reader who has followed the argument regarding the relevance of future cash flows to investment decisions is likely to agree that the discounted future cash flow method and the future cash flow method rank first and second respectively for application to liabilities.

The market value group of methods, including net realizable value and replacement cost, may also have some applicability to liabilities, but there are dangers in measuring the firm's own debt at its market value. The market value of a firm's debt may change for various reasons, especially changes in the market rate of interest and changes in the risk associated with the issuer. To the extent that the latter influence is applicable, any revision of the liability amount would result in an offsetting change in the shareholders' equity in the opposite direction to that implied by the market's changing view of the firm's prospects. For example, if the market lowered its opinion of the firm's future, it might mark down the firm's debentures. If the accountant for the issuing firm reduced the liability amount and recorded the offsetting credit as an increase (of any type) in the shareholders' equity, the balance sheet probably would be made less relevant to investors' decisions. This would be similar to providing for bad debts on the books of the debtor. This danger leads us to favour changing the discount rate applied to debt only to the extent of changes in the market rate for the original risk class of the debt at its issue date, not for changes in the discount rate applied by the market to the issuer's securities because of changes in the perceived risk associated with the issuer itself. We would avoid the use of market value and its derivatives as a measure of monetary liabilities.

Nonmonetary liabilities, such as obligations to perform services or deliver goods, are a different story. While the traditional approach is to show them at what

could be called historical receipt – the amount of money received in exchange for the services or commodities to be provided – we should call attention to the possibilities of applying the negative versions of net realizable value (the estimated cost of discharging the obligation as at the balance date) and replacement cost (the amount of money for which the goods or services could be sold at balance date). We do not feel justified in devoting much space to these methods in this study, but we do believe that they outrank the traditional historical receipt method on the criterion of relevance – our only consideration in this section of the paper.

(v) *Summary of rankings on basis of relevance*

We can now summarize our analysis of the rankings of measurement methods on the basis of their relevance to investment decisions and other cash-flow oriented decisions:

1. Face value of cash.
2. Discounted future cash flows.
3. Future cash flows.
4. Net realizable value.
5. Market value.
6. Replacement cost.
7. Equity method.
8. Adjusted historical cost.
9. Historical cost.

This list is subject to the following notes keyed to the numbered methods:

1. Rarely applicable to noncash items.
2. Rarely applicable to nonmonetary items.
3. Rarely applicable to nonmonetary items.
4. Ranks below replacement cost and market value in application to up-to-date assets held for use.
5. Not generally appropriate for application to monetary liabilities; ranks below replacement cost and above net realizable value in application to up-to-date assets held for use.
6. May be based on either production or direct purchase and may be calculated with the aid of an index of prices for a narrow class of goods; ranks above market value and net realizable value in application to up-to-date assets held for use.
7. Applicable only to shares owned.

We stress, again, that these rankings do not constitute endorsement of any method for application to any particular category of assets or liabilities. We are only considering the relevance criterion of usefulness in this section; final selection of a measurement method for application should be based on

all of the applicable criteria outlined in the introduction, especially reliability – the subject of the next section.

The reliability criterion

We have much less to say about the reliability of measurement methods than about their relevance, because reliability is dependent upon the particular type of asset being measured and its specific circumstances; generalizations will not suffice. The relevance of a measurement method, on the other hand, is a general characteristic; discounted future cash flow is always a highly relevant method whether it can be applied or not. As soon as we recognize this we see why measurement methods can not be ranked on the basis of usefulness for general application; it must be left to the professional judgment of the accountant to select the measurement method to be used in the particular circumstances surrounding a case. In making this selection he must consider relevance (which he can appraise in advance) and reliability (considering the specific circumstances) as well as other criteria such as comparability, neutrality, timeliness and understandability.

In order to impress upon the reader the variations in reliability of any one measurement method on different applications, we present a tabulation indicating some fairly general cases in which a measurement method may be relatively reliable, of doubtful reliability and relatively unreliable, respectively. Reliability does not mean the accuracy with which the true value of an asset is measured; it is more a matter of the accuracy with which the selected property of the asset is measured. For example, the reliability of historical cost is not tested by its correspondence with current market value, but by how several measurements of the historical cost of an asset, as calculated by several different accountants, vary among themselves, and from the 'true' historical cost of the asset. And, in addition to the types of variations in reliability illustrated in Exhibit 3, there can also be differences within any one case listed there. For example, the amortized historical cost of an intangible asset with an original legal life of five years can be measured with greater reliability than the amortized historical cost of goodwill. Finally, we suggest that accountants do, and must, have some sort of a minimum level of reliability below which measurements should not appear on financial statements, regardless of the merits of the measurement based on other criteria.

Application of other criteria

A measurement method should not be used merely because it ranks high on *one* criterion. We believe

Exhibit 3. Examples of Possible Applications of Measurement Methods with Different Levels of Reliability

| Measurement Method | Relatively Reliable Applications | Applications of Doubtful Reliability | Relatively Unreliable Applications |
|--------------------------------------|--|---|------------------------------------|
| Discounted future cash flows | Debtors of good credit standing | Debtors of poor credit standing | Work in progress; plant assets |
| Net realizable value or market value | Listed shares; stocks of saleable metals | Real property with specialized improvements | Patents; copyrights |
| Replacement cost | Common grades of timber, sheet steel and other materials | Specialized structures | Patents; copyrights |
| Historical cost | Securities; commodities purchased on a c.i.f. basis | Joint products; debtors; amortized intangibles; depreciated buildings | Self-developed goodwill |

that the accountant must consider all of the criteria suggested in the introduction. Several of these criteria appear to be applicable primarily to the presentation of financial information rather than its accumulation. But our concern in this paper is with the selection of a measurement method, a choice in which we believe the criteria of relevance and reliability should carry the greatest weight in the majority of cases. However, the criteria of comparability, neutrality, timeliness and understandability can also affect the accountant's choice of measurement method.

The importance to the user of *comparability* of financial information is commonly recognized. But under what circumstances should the accountant discard or adopt a method which is superior on other criteria in favour of one that is superior in comparability? Many issues involving comparability are intra-entity issues which do not involve the accounting methods of other entities. In these cases, in which the entity's accountants have the opportunity to change any of the methods which appear to yield measurements which are not comparable (within the entity), it would appear that the one to be changed should be the one that leaves something to be desired on the criteria of relevance and reliability. Thus, it would only rarely appear to be necessary to choose a method that is inferior on relevance and reliability because it is comparable to what is done somewhere else in the entity. With regard to inter-entity comparability, however, if we can not convince the accountants for other entities that our method is superior on other grounds, we may have to sacrifice some relevance, reliability, or other desirable attribute for the sake of comparability (and maximum value of the information to external users).

The additivity aspect of comparability should be mentioned here. The traditional scientific meaning

of the term 'additivity' is that an additive property is one the numerical value of which is equal to the sum of the values of the component parts, i.e., that the sum of the parts is equal to the whole. Weights are additive; temperatures are not. It would appear that none of the properties commonly associated with assets are additive in a practical sense; for example, the sum of the market values of individual assets is not equal to the market value of the company. But conceptually market value, discounted future cash flow, historical cost and other such properties are additive; the market value of a ton of copper plus the market value of a ton of cocoa can reasonably be expected to be equal to the market value of a load of goods consisting of one ton of copper and one ton of cocoa. Properties of this type are certainly more like weights than temperatures. In addition to the requirement of an additive property, we also prefer to be adding measurements of a common property, such as weight, rather than adding measurements of weight to measurements of height. Are the various attributes we have discussed a common property? We believe they are estimates of a common property, viz., discounted future cash flow. The several surrogates for DFCF are different ways of estimating DFCF; they may be added without serious conceptual difficulty. Additivity also requires a common measurement scale; metres and yards should not be added. Nor should pounds of different sizes be added; all measurements which are added on one financial statement should be stated in the same measuring unit – preferably the current monetary unit of the country in which the user is domiciled. Finally, we suggest that imperfections in the additivity of our measurements should be cause for concern but they do not necessarily invalidate the results.

We also suggest that comparability of measurements used in management decision-making and measurements used in reporting the consequences of those decisions is a criterion that might reasonably influence the choice of a measurement method.

The criterion of *neutrality* appears to be occasionally pertinent to choices of measurement methods, for example, when one or more of the alternative methods involves a risk of overstatement or understatement.

Timeliness may, in the minds of some readers, be related to the dates of the market prices used in the measurement methods, but we consider that matter to be covered by relevance. The timeliness criterion is intended to include the frequency of reports and their delay in presentation after the balance date. This criterion could affect the choice of measurement method if the use of one of the alternatives would

delay the reports.

The *understandability* criterion could affect the accountant's choice of measurement method if he judges that one method, or his explanation of it in the reports, would be less understandable than another method. The accountant's own understanding, however, may be a more critical basis for choice of measurement method. If he does not know how to apply, or does not feel comfortable with, one method, his choice of method may be biased. For this reason, we suggest that an accountant is not properly trained for positions involving responsibility for choice, or approval, of measurement methods if he is not thoroughly familiar with a wide range of possibilities.

Summary

The determination of the amounts of assets and liabilities, and of those financial statement items which depend upon assets and liabilities, is a critical step in the provision of useful financial information. A set of criteria of useful financial information should be used by the accountant in choosing the best measurement method for use in a specific situation. The criteria suggested in the introduction were: relevance, reliability, comparability, neutrality, timeliness, understandability, optimal disclosure and readability'. Relevance is the primary criterion to be used in the selection of a measurement method. The nine measurement methods discussed in this paper were ranked on the relevance criterion in the following order: face value of cash, discounted future cash flow, future cash flow, current net realizable value (in the market in which the asset is expected to be sold), current market value, current replacement cost, equity method, adjusted historical cost, historical cost. These rankings are general; discounted future cash flow data are always more relevant to cash flow oriented decisions than are the data produced with any of the lower ranking methods but DFCF may not be the best method for use in a particular case because of weaknesses of other criteria. The methods can not be ranked for general use on any of the other criteria, although they may be ranked in relation to a specific case. No measurement method is generally the most reliable, the most comparable and so on. But the discounted future cash flow method is generally the most relevant method for application to noncash items, replacement cost is more relevant than historical cost, and so on. So the accountant responsible for selecting a measurement method must take into consideration the known relevance of the alternatives to the decisions of users, judge the reliability, comparability, neutrality, timeliness and understandability attributes of each method, then temper it all by consideration of the cost of accounting for an item by that method. This process

requires the judgment of a well-trained and experienced professional person. We do not claim that this set of criteria makes the accountant's work simpler; we do suggest that it can make it more productive from the standpoint of users.

When the accountant measures assets and liabilities satisfactorily, he also measures revenues, expenses, gains, losses, profit and shareholders' equity satisfactorily. Every entry that affects the profit and loss account, or shareholders' equity directly, also affects an asset or liability, so the measurement problems pertaining to flows (or changes in positive or negative stocks of service potential) have been solved when the problems of measuring assets and liabilities are solved. For example, credit entries to sales, interest earned or other revenue accounts are offset by debits to cash, debtors or some other asset account (subject to possible exceptions involving liability debits). The measurement of the debit is an asset measurement problem; the credit to revenue is then set equal to the debit. When the accountant chooses to measure finished stock at net realizable value (rather than historical cost), he will still record that stock and its consequent effect on the profit and loss account. He may possibly record, in profit and loss, only the gain or loss represented by the difference between accumulated costs and net realizable value, or he may credit the net realizable value to revenue and debit the accumulated costs to expense, but the effect on profit is the same and is determined by the measurement of the stock at net realizable value. Expenses, too, are measured when assets and liabilities are measured. Nevertheless, choices of measurement method should be influenced by the effects of the measurements on the usefulness of the profit and loss account as well as their effects on the usefulness of the balance sheet. We certainly do not intend to argue that the balance sheet is the more useful statement; we only argue that the measurement problems can be solved more readily by focusing on the stocks rather than on the flows.

At this point, an example may help to clarify the significance of our argument. Smith and Jones each have a 50% interest in a small company which manufactures chocolate products from cocoa beans. They have been in business for several years and have substantial wealth not invested in the business. At the beginning of year 7, they decide to invest substantial additional sums and to start a number of new divisions, each as a fully owned subsidiary (alongside the original chocolate operation which is now known as company G) of a new Holding Corporation. At this expansion date they further agree that at the end of year 7 each shareholder would have an opportunity to buy, from the Holding Company, any sub-

subsidiary at its 'book value' according to its own balance sheet; but subject to the agreement of the other shareholder. If they both wanted a particular subsidiary, a decision would be made by flipping a coin. Note that this arrangement places heavy reliance on the balance sheets of the companies, and that neither shareholder can be sure whether he might be buying or selling an interest in any given subsidiary.

The new subsidiaries were: Company A and Company B, both of which entered the finance business; Company C and Company D, both of which went into securities investments; Company E and Company F, both of which were to carry on agricultural operations, especially wheat production; and Company H, which went into competition with Company G as a chocolate manufacturer. A manager was appointed for each subsidiary and given full responsibility for fundamental decisions (other than raising new equity capital) and day-to-day operations. Each manager was to receive a salary and a bonus equal to 15% of profits and, for reasons which were never quite clear to anyone besides Smith and Jones, the agreements called for the managers of each pair of similar subsidiaries to exchange positions at the beginning of year 8. This arrangement made the assessment of managerial performance for the year, and for the succeeding year, of great importance to the managers.

Now consider some measurement problems that faced the accountants in this group of companies. The two finance companies, A and B, started the year with equal capital and both made loans based on promissory notes with no stated interest. The interest factor was reflected in the difference between the amount lent and the maturity value of the note. They borrowed from banks on similar notes. At year-end, the two companies had equal amounts of cash, loans outstanding measured at maturity value, notes payable to banks measured at maturity value, and shareholder's equity based on the reported assets and liabilities. The two loan portfolios appeared to be equally risky, but A's notes receivable had an average maturity date one year in the future while its notes payable were due in three years; B's loans were to mature in three years while its liabilities to banks were due in one year. The accountants were questioning whether the future cash flow method or the discounted future cash flow method was the most appropriate for application to the notes receivable and the notes payable. Based on the future cash flows called for by the notes, the positions of the two companies were equivalent at year-end, but if the notes were discounted Company A would show higher earnings and shareholders' equity because its shorter-term debtors would be greater than B's and its longer-term

liabilities would be less.

C and D both invested in shares and debentures. C chose mostly listed securities and took many profits near the end of the year, reinvesting the proceeds in similar securities, but held on to securities on which it had unrealized losses. D's portfolio included substantial amounts of unlisted securities for which no market quotation was available. Furthermore, the directors of some of the companies in which D invested had followed a policy of emphasizing growth and paying no cash dividends while good expansion opportunities were available. D sold few securities during the year. The accountants were undecided about the propriety of using historical cost, current market values of the listed securities, or the equity method on unlisted shares.

Company E's wheat crop was sold immediately upon harvest at a small profit. Company F managed to obtain a much higher yield than Company E (under comparable environmental conditions) and chose to hold its wheat in anticipation of a rise in the market price. At the balance date F is still holding and the price has risen. Historical cost and net realizable value are under consideration by the accountants for application to the stock of wheat held by F.

Companies G and H competed on relatively equal terms in the chocolate business except that, early in the year, G stocked up on cocoa beans in anticipation of a price rise while H held its inventory of beans to a minimum. The price fell substantially during the year, then H built up its inventory and the price rose near the end of the year but not up to the level at which G had bought its speculative stocks. At the year-end G had unrealized losses while H had unrealized gains. The two companies had nearly identical equipment except that G's was purchased six years earlier at prices averaging 65% of those paid by H. Thus H's depreciation, based on historical cost, would be higher; if both used replacement cost, their depreciation charges would be equal. Maintenance costs and productivity of the older equipment were equal to those of the new. The accountants were arguing about the relative merits of replacement cost (which was readily determinable) and historical cost of the equipment and the stocks of cocoa beans.

We suggest that the reader decide for himself which of the alternative measurement methods should be used in each case under the assumption that reliable measurements can be made by each method. In making his choice, we suggest that the reader think of himself as being in the position of either Smith or Jones and in the position of one of the managers. The decisions which are to be made on the basis of the measurement choices include the selling price of each subsidiary and the bonus of each

manager this year and of a different manager next year. More specifically, these questions should be asked:

- (1) What measurement method should be applied to each item discussed, in order to appraise each manager's performance on behalf of owners in year 7?
- (2) What measurement method would be most equitable for comparison of managers in the new year? Would you choose a method which could give a new manager substantial 'instant profits or losses' just by calling a commodities or securities broker?
- (3) What measurement method would be most equitable for use in setting a price at which a subsidiary will be bought and sold at year-end?

We are not going to state our choices in these cases and we suggest that the reader not think of his answers as being suitable in all cases that appear to be similar. Variations in reliability, comparability and other factors can warrant different answers for different commodities, different industries and differences in other circumstances. But we do believe that there should be uniformity of choice in one respect, viz., the measure that is most useful for setting a price on the business is also most useful for appraising the top management and for computing the profit or

loss for the year.

A final comment on the relevance and reliability of measurements seems appropriate. Some current practices, for example in the areas of intangibles and deferred development and exploration costs, appear to rate quite low on the criterion of reliability, especially after a considerable lapse of time since the original expenditures were made and when the reliability of the amortization appearing in the profit and loss account is considered. This is particularly disturbing when one thinks of these measurements as also ranking low on the relevance criterion, since they are usually based on historical cost. This is not to say that any of these practices are necessarily wrong, but it does emphasise that accountants often are required to make the difficult choice between a relatively poor measurement and none at all, or measuring the item at zero. Not only is it conceptually possible that a poor measurement involves a greater error (by overstatement) than does the zero measurement, but the deception of those readers who think it is a good measurement may be quite serious. We believe that accountants must face up to the fact that many things that appear to have positive cash flow potential can not be measured with an acceptable combination of reliability and relevance; an alternative technique of reporting the history of 'intangible investments' is needed.

An Accessions Tax: The Problem of Trusts

C. T. Sandford, J. R. M. Willis and D. J. Ironside

Introduction

It has been said that some Green Papers are greener than others and that the Inheritance Tax Green Paper is the greenest so far. This is apparent from its title and its content, both of which are more than ordinarily tentative. Nor have the proposals contained in the Green Paper been received with any great enthusiasm; among solicitors and accountants the general reaction is to prefer the devil they know. Even those who, in principle, are in favour of the change, tend to damn it with faint praise. In particular the Green Paper proposals for the application of an inheritance tax to trusts are widely thought to be unsatisfactory. Furthermore many people believe that neither an estate duty nor an inheritance tax will be effective unless combined with a gift tax. The United Kingdom is now almost alone among the larger 'mixed' economies in not having a gift tax either on donors or donees. Since an accessions tax is an integrated tax on gifts and legacies received we hope that the publication in September 1973 of our study of the desirability and feasibility of such a tax will enlarge the area of debate.¹ The study includes proposals for the application of accessions tax to trusts, some of which are also relevant to an inheritance tax or a donee gift tax.

Brief description of Accessions Tax

The idea of an accessions tax (hereinafter referred to as AT) is not new; it has been widely discussed in the USA and in this country has been advocated by several

writers². The concept is very simple. When a gift or legacy is received the recipient pays AT on a progressive scale based on the accumulation of such accessions throughout the recipient's lifetime. Suppose for example, that the AT scale is the same as the present estate duty scale and that A has previously had accessions totalling £40,000 on which he has paid AT of £7,750. If he receives a further legacy of £20,000 the AT payable by him would be £8,500 (i.e. the AT on £60,000 of £16,250, less the AT paid on the previous occasions). Thus there would be a lifetime exemption (of £15,000 if the scale is the same as the estate duty scale); in addition, for administrative reasons, there would be an initial exclusion of the first £250 (or other chosen amount) of any gift. For this purpose all gifts from the same donor in the same year would count as one gift.

Advantages of AT

Compared with other forms of transmission taxes on wealth an AT is more equitable, in the sense of equal treatment of those of similar taxable capacity. (It can be argued that a tax related to the present value of all the inherited wealth of an individual is superior but it is not practicable to separate inherited wealth from wealth created by an individual's own efforts.)

The tax does not depend on the form of the accession (whether gift or legacy) nor does it depend on gifts

¹This article is based on a study undertaken at Bath University of the desirability and feasibility of replacing the United Kingdom estate duty by a cumulative tax on recipients of gifts and inheritances. The project was sponsored by an anonymous charitable trust and the Institute for Fiscal Studies. The full study is to be published by the I.F.S. in September 1973 under the title *An Accessions Tax* and is obtainable from R.P.S. Ltd., London, SE9 0RF Price £2.50.

²H. J. Rudick (Professor of Law at New York University), 'What Alternative to the Estate and Gift Taxes?', 38 *California Law Review* 150 (1950); William D. Andrews (Professor of Law at Harvard Law School), 'The Accessions Tax Proposals', 22 *Tax Law Review* 589 (1967); Carl S. Shoup, (Editor) *Federal Estate and Gift Taxes*, The Brookings Institution (1966), (The report of an international conference); J. E. Meade, *Efficiency, Equality and the Ownership of Property*, Allen and Unwin (1964); Oliver Stutchbury, *The Case for Capital Taxes*, Fabian Tract 388 (1966); C. T. Sandford, *Taxing Inheritance and Capital Gains*, Institute for Economic Affairs (1967) and *Taxing Personal Wealth*, Allen and Unwin (1971); A. B. Atkinson, *Unequal Shares*, Allen Lane (1972).

being within an inter vivos period of risk. It is directly and progressively related to aggregate benefits received. Under an AT it is easy to give tax relief to take account of the particular circumstances of beneficiaries such as widowhood or dependancy. It also tends more than other transmission taxes, to reduce inequalities of wealth arising from inheritance or gift. The larger the aggregate accessions received by any one person, the higher the tax; and the more a testator or donor spreads his wealth among recipients who have had few other accessions the less the AT will be.

Purpose of transmission taxes

This is not the occasion to present the argument in full but it is widely accepted that the principal purpose of transmission taxes on wealth is to reduce inequalities in wealth arising from inheritance or gift. Such taxes have little effect in reducing demand (which is a primary purpose of, for example, income tax and turnover taxes) and their main effect (apart from reduction of inequality) is to reduce the amount which the government needs to borrow. Thus the choice of an appropriate scale and a desirable yield is governed more by social considerations than by fiscal ones. However for the purposes of this article we have assumed that the AT scale is the same as the present estate duty scale.

The basic problem

An outright gift or bequest of property confers two rights on the individual who receives it; the right to the unfettered use of the capital and the right to any income which it produces. The taxation of the gift or bequest under a gift or death tax diminishes both capital and future income. The problems which arise in applying gift or death duties to trusts stem from two main causes:

(a) In some trusts income accrues to one beneficiary (or group of beneficiaries) and capital accrues to another beneficiary (or group of beneficiaries). This poses problems as how the separated interests should be taxed.

(b) In many trusts the benefits accruing to beneficiaries (whether interests in income and capital are separated or not) are incapable of quantification in advance of the events. They may depend on the fulfilment of some contingency, on the future exercise of a power of appointment or on the unfettered discretion of trustees. Thus an initial tax is bound to be arbitrary whilst a tax by reference to events may be long deferred, perhaps for as much as eighty years.

In view of these problems two fundamental questions may be asked. Should the ability to create trusts be abolished or severely restricted? (Except in very simple forms they are not used in other EEC

countries.) And are trusts compatible with either an inheritance tax, donee gift tax or AT? (Broadly speaking countries which have trusts use an estate duty and a donor gift tax, while other countries use an inheritance tax and a donee gift tax.) It would not be appropriate in a study of this kind to recommend severe restrictions on the ability to make trusts and for our part we are satisfied that there are many circumstances where trusts have a valid non fiscal motive. Examples which spring readily to mind include discretionary or protective trusts for spendthrifts or persons subject to mental disability and trusts established by Will for infants. Furthermore we are opposed, if only because of the considerable problems of categorization and definition, to any attempt to differentiate in tax treatment between 'worthy' and 'unworthy' trusts. However, there is no doubt that the problem of taxing trusts would be reduced in scale if trusts were no longer permitted to last for about eighty years but for some lesser period; and we have the impression that such a change could be made without any serious reduction in the utility of trusts for non fiscal purposes. The remainder of this article attempts to answer the second question posed earlier in this paragraph; are trusts compatible with an inheritance tax, donee gift tax or AT?

Kinds of trusts

For the benefit of the reader who is not in touch with trust practice, it may be desirable to give some account of the kinds of trust which are most frequently encountered. We also include two proposals for change in the treatment of trusts for income tax purposes and assume in the remainder of this article that these two proposals are implemented before the introduction of an AT. The main kinds of trusts with which we are concerned in this article are:

(a) A trust giving a life interest or an annuity to a named individual or individuals. The destination of the capital after the death of the life tenant or annuitant may be fixed at the inception of the trust (and may or may not depend on a contingency) or may depend on the exercise of a limited or general power of appointment or of a discretion. For two reasons such trusts are much less common than they used to be. Firstly, if established by Will or within seven years prior to the death of the settlor, estate duty is payable on the death of the settlor by reference to the whole of the settled fund and again on the death of the life tenant on the fund as thus reduced. Secondly, the need to hold a balance between the interests of the life tenant and the remainderman can exert an inhibiting influence on investment policy. Taxation considerations frequently make it desirable to invest in securities with low current income but

high potential gain. (In other words, investment policy is directed towards maximization of aggregate after tax return whether from income or gain.) But in a trust of this kind adoption of such a policy may unduly reduce the income available for the life tenant. It is possible to authorize the trustees to draw on capital to supplement the income accruing to the life tenant; but such supplementary payments are taxable as income of the life tenant if they are regularly paid to supplement income rather than as irregular payments to meet exceptional needs (*Brodie's Will Trustees v IR Commissioners* 17 TC 432). There seems to us to be no equitable basis for this rule and we therefore propose that payments (even of annuities) derived from trust capital should not be taxed as income (subject, however, to the change suggested in paragraph (b) below).

(b) A trust whereby income and capital are held for the benefit of a named individual or individuals contingently on the happening of a specified event (commonly the attainment of a stated age or marrying under that age, with a gift over to some other person if the event does not happen). The trust may direct that the income be accumulated (for a period which does not exceed the permitted accumulation period) and dealt with in the same way as the capital or that it be used or be either accumulated or used at the trustees' discretion. Income from such a trust used for the benefit of an infant child of the settlor is taxed to income tax as if it was the settlor's income but not if it is accumulated. Income which is accumulated and later reaches beneficiaries in capital form is not taxable to higher rate income tax (although under the Finance Act 1973 it is subject to investment income surcharge). We think that this treatment is unduly favourable and suggest that whenever income is paid out of a trust it should be subject to higher rate tax in the hands of beneficiaries. If this change is made it would probably be necessary to provide that any payment (no matter how described) made by trustees to beneficiaries should be treated as income if it was made at a time when there was accumulated income in hand. And some form of averaging relief would have to be given (because payment of several years' income in one year could invoke higher rates of tax than if the income were spread over a period). These changes should also be applied to other kinds of trust in which accumulation of income takes place.

(c) Protective trusts for spendthrifts or persons subject to mental disability. During the lifetime of the person or persons in question income, and perhaps capital, is available at the discretion of the trustees for the maintenance and benefit of that person; after his death the gift over may take various

forms as in paragraph (a).

(d) Discretionary trusts for a large class, typically including the settlor's issue, other dependants, other relatives, charities and possibly non charitable associations. Trustees usually have unfettered discretion as to the application of both capital and income amongst the class but in some cases their discretion may apply only to income or to capital or be restricted in other ways. Exceptionally income may be applied to one class and capital to a different class. Income can often be accumulated in such a trust for very long periods to emerge free of higher rate tax.

It should be remembered that almost any form of property can form the subject matter of a trust; quoted shares, private company shares, land and buildings, insurance policies, pictures, chattels etc. Trust assets may or may not produce taxable income; some are enjoyed in kind (e.g. pictures or a residence).

Objectives

Ideally, taxation should be neutral between outright gifts and gifts in trust, so that a donor would not be influenced by tax considerations in deciding whether to give property to his beneficiaries outright or to create a trust and perhaps thereby to separate the income rights and capital rights and allocate them to different individuals or groups of individuals. If this ideal is unattainable, any bias should be against trusts rather than in favour of them for several reasons. First, as things stand, many trusts – especially discretionary and accumulation trusts – are created solely or largely to save tax. Secondly, even if the settlor is not particularly concerned to save tax, it is a reasonable presumption that he has created the trust because he considers that by so doing he is doing better for his beneficiaries than if he distributed the property among them by outright transfers. If by this means the welfare of the beneficiaries has been increased compared with outright transfers, it is reasonable for any tax bias to be against the beneficiaries rather than the reverse. The extreme flexibility of the law of trusts in this country compared with the narrow limits within which property may be settled under Continental systems of law, confers advantages on the wealthy in Britain for which donors or their beneficiaries may reasonably be expected to pay. Thirdly, and most important in the context of the AT, the effect of trusts is to maintain concentration of wealth, and in particular of the power that goes with wealth, often through several generations. Indeed, particularly in the case of large trusts, this is often a principal aim of those who establish trusts. In principle, therefore, they run directly counter to an essential purpose of the AT, which is to reduce concentrations of wealth

and encourage its wider distribution.

In attempting to formulate a viable scheme for the application of AT to trusts, our principal objectives have been:

- (a) To propose a solution that is equitable and rational rather than arbitrary. But, since bias is inescapable, it should be against rather than for trusts. However, a solution which creates some bias in favour of trusts (rather than outright gifts) for people with low income or low AT totals seems unobjectionable, because administration costs bear more heavily on such trusts and they are unlikely to be set up except for non fiscal reasons.
- (b) To have a basic system which is universally applicable to all trusts (because otherwise there are formidable problems of categorization and definition with consequent attempts by taxpayers to exploit the rules).
- (c) To avoid a complex system; so far as possible the scheme should be readily understood and easy to administer.
- (d) To design a structure that should be capable of gradual evolution as experience is gained (but recognizing that, once an AT is established, major changes in structure or rates are undesirable).

The alternatives

At the commencement of this study it was soon apparent that there were several ways of taxing trusts:

Related to capital:

On the amount put into a trust at inception ('Inception tax').

Periodically by reference to current values ('Periodical capital value tax').

On withdrawals as and when they take place ('Withdrawal tax').

Related to income:

By reference to the assets required to produce the income ('The Rudick method').

By reference to the actuarial value of the income flow ('The alternative Rudick method').

On gross receipts ('AT on gross income').

On receipts net of income tax ('AT on net income').

Some of these might be used alone (e.g., an inception tax); others in conjunction (e.g., a tax on income with a withdrawal tax). In addition, there was the possibility of imposing an arbitrary tax on setting up a trust which would be credited against any withdrawal tax that became payable ('advance accessions tax = AAT').

The deferral problem

It is evident that the alternatives listed in the previous paragraph postulate payment of tax at very different dates and, less obviously, that payment of AT at one date rather than another can have consequential effects on the yield of other taxes (e.g., income tax and capital gains tax). Deferral of tax causes two difficulties:

- (a) The problem of comparing one solution with another or (more importantly) comparing any one solution with an outright gift or gifts; and
- (b) The postponement of revenue.

The comparison problem is largely a question of the rate of compound yield (income plus gain) which should be applied to early payments of taxes (of all kinds) for the purpose of making a comparison at a later date which is common to the methods under review (or conversely, for those accustomed to thinking in terms of discounted cash flow, of the rate of discount appropriate for the purpose of present value comparisons). Possible rates are that paid by the Government on its borrowings, that actually earned by the taxpayer (net of taxes) or that which would be notionally earned by the taxpayer had the early taxes not been paid (again net of taxes). No wholly satisfactory solution has been found. The method which has been adopted in the examples in the appendix is to use a rate of yield (net income plus net capital gain) which, whilst chosen empirically, seems reasonably attainable by the taxpayer in the postulated circumstances. Instead of applying that rate to the taxes paid, it has been used for the purpose of accumulating income to the end of a trust period so that the comparison is of what is left after taxes at the end of the period. Indirectly this gives the true yield of all taxes during the trust. (The phrase 'true yield' is used in this article to refer to the yield of a tax as adjusted by compound interest.) This indirect method has been used largely for ease of computation.

There is a further difficulty in making comparisons between the tax effects of an outright gift or gifts with those of a trust (even assuming that a gift or gifts can be tailored to achieve much the same effect as the trust under consideration). Under an AT the timing of a gift is less significant than it is under estate duty (there is no special period of risk for gifts inter-vivos) but, even so, if a particular asset rises in value, it will be advantageous to give it earlier rather than later. Since trusts have the effect of deferring the time at which capital vests in beneficiaries, the question can be asked whether, in making comparisons with an outright gift or gifts, it should be assumed that the outright gift was made at the time when the trust

was set up or when the capital was distributed from the trust? There is no simple answer. Paragraphs 5 and 6 of the appendix illustrate the point.

Deferral also raises the question of the effect of inflation. Throughout this article and the appendix stable money values and an unchanged scale of rates of AT are assumed. (We think that in order to offset the effect of inflation rate bands would need to be widened from time to time if the real burden of the tax is not to increase).

An inception tax

The basic scheme of taxing simple trusts (for example, a trust for A for life, then for B for life with remainder to C) under estate duty is to tax on the settlor's death (unless the trust was created more than seven years before the settlor's death) and to tax the remaining fund again on the death of each successive life tenant. The rate of the initial estate duty is fixed by reference to aggregate dutiable assets of the settlor and similarly on the death of each life tenant. This treatment is so disadvantageous to beneficiaries compared with available alternatives that life tenancies are comparatively rare in modern settlements except:

- (a) Will trusts in favour of a surviving spouse (when there is exemption on that spouse's death).
- (b) When the duty payable on the death of a life tenant will be small.
- (c) When the life tenant is very young (so that the actuarial value of the life interest will approach the full capital value of the fund); or
- (d) When the trust is created more than seven years before the death of the settlor so that the initial charge is avoided.

Originally settled property paid estate duty only once during the continuance of the settlement but in 1914³ the law was changed and since then it has been charged on the full capital value of a trust fund each time it passes on a death. The legacy and succession duties followed the principle of taxing the actuarial value of a life tenant's interest. The Green Paper admits that it could be argued that the actuarial value method should also be applied for the purpose of an inheritance tax but concludes that to do so 'would be to confer an undue advantage on settled property. The enjoyment of property held in trust can pass from generation to generation and the substance of what has happened may well be the same as if each generation had passed on an absolute bequest to its successor.' The Green Paper argument is valid only if it is assumed that the whole property has to pass through the ownership of each successive generation. That is

not a necessary assumption.

The substantial effect of a life tenancy can in fact be achieved by means which do not involve payment of tax twice over on the full value of the fund. A settlor who wishes to provide his beneficiary with a given amount of resources to live on can, instead of settling a fund which will produce that amount as income, settle a smaller fund with the intention that both the capital and the income shall be used up during the beneficiary's life. If this smaller fund equals the actuarial value of a life interest in the larger fund, the beneficiary (assuming him to live for the expected period) will have the desired amount of spendable resources and the fund will not be taxed twice over because it will have been exhausted. The balance of the larger fund would be given direct to, or put in trust for, the persons who would have been the remaindermen under a settlement of the entire fund. The total tax yield under a 'split-gift' arrangement of this kind would be much the same, allowing for the different dates on which tax becomes payable, as that which would be produced if the entire fund was settled and the life tenant's and remainderman's interests were charged on their actuarial value only.

This reasoning leads to the rejection of the Green Paper argument in favour of taxing the whole fund at inception by reference to the life tenant's circumstances and again as successive interests come into operation and instead to the conclusion that it would be equitable to apply AT to a simple trust (e.g., to A for life, then to B for life, with remainder to C) at its inception by reference to the actuarial value of the various interests in the fund. However, so doing would have the effect of reducing the first life tenant's income, because AT has been paid at inception, not only (quite properly) on the value of his own interest but also on the interests of later life tenants and of the remaindermen. This could only be remedied by deferring AT on the later interests until they fell in. Even this modified proposal would involve considerable problems. Valuation methods are bound to be arbitrary (for example with regard to expected yield and the incidence of income tax) and yet could not, without injustice, ignore impaired health (itself an invidious issue to have to raise). Concurrent life interests would also be a problem.

However, a more fundamental objection is that few trusts are of this simple type. It is impossible to value discretionary interests and there would be great difficulty in dealing with contingent interests or interests that were liable to be reduced (for example because children entitled to benefit from the trust are born after the creation of the trust). To charge the whole of a discretionary trust at the rate appropriate to the beneficiary with the highest cumulative total

³SI4 FA 1914

(adopting a suggestion put forward in the Green Paper in relation to inheritance tax) could be grossly unfair to low-rate beneficiaries, and only less severe than charging it at the maximum rate in the scale. To charge at some arbitrary rate short of the maximum would not only be unfair to beneficiaries with lower rates but would favour wealthy beneficiaries whose personal rates were higher.

An arbitrary tax on the inception of a trust ('advance accessions tax') which is credited against any subsequent withdrawal tax that becomes payable is considered in later paragraphs.

A periodical capital value tax

If there is to be no inception tax and no AT on income, it seems worth considering whether AT could be applied, say every ten years, to a fraction of the capital (say one-third) divided among beneficiaries by reference to the slice of income taken by beneficiaries in the period just ended by methods similar to those introduced in 1969 for the charging of estate duty on discretionary trusts. An equitable scheme on these lines could probably be evolved to deal with a trust from which there were no withdrawals of capital except on the winding up of the trust. Even in those circumstances it would not be easy to devise a satisfactory relationship between the periodical capital value tax and the withdrawal tax. And without resort to extremely complex methods it does not seem possible to deal equitably with trusts from which there are interim withdrawals of capital.

A withdrawal tax

Taxing withdrawals seems the natural way of taxing the capital of a trust to AT. It taxes beneficiaries on what they get when they get it. Such payments, at the time of receipt, are no different from outright gifts or bequests. However, such a tax is likely to result in the deferment of the payment of tax for a very long time after the inception of the trust. That may not matter greatly if the trust has grown in value very substantially; the true yield may then be greater than that from an inception tax. This is because, under a progressive tax, the tax on withdrawal may involve much higher rates (unless the fund is divided over a greater number of beneficiaries, in which case the tax has served its purpose). But if the fund does not grow at all (perhaps because the trustees have deliberately chosen high yield securities) a withdrawal tax at normal rates would be the same as an inception tax based on the same facts. The Revenue would not be compensated for the delay. It is tempting to think in terms of charging interest on a withdrawal tax from inception to the time when withdrawal takes place. This will not do, partly

because there is no justification for charging interest on withdrawals from a fund which has grown substantially; and also because, even with an average rate of AT as low as 30% and a compound interest rate of 3%, a withdrawal taking place after forty-one years would be wholly absorbed by AT.

It may, therefore, be not unreasonable to say that no interest is charged on the basis that the Revenue participates in the investment performance of the fund. If it is good the Revenue does well; it not only receives 'interest' at the same rate as the rate of growth of the fund but it also benefits from the effect of progressive rates. If it is bad then the Revenue suffers, at least in true yield.

An example may be helpful. Assume a fund of £100,000 which grows at 6% per annum over forty years to £1,028,572 when it is distributed to A £873,572, to B £150,000 and to C £5,000. A and B have had no previous accessions but C had an accession of £15,000 before the trust was set up. AT is on the same scale as the present estate duty. Had the fund been distributed in the same ratios when set up, the AT then payable would have been:

| | Amount of gift £ | AT thereon £ | AT with interest at 6% for 40 years £ |
|-------|---------------------|-----------------|--|
| A | 84,931 | 28,963 | 297,905 |
| B | 14,583 | Nil | Nil |
| C | 486 | 122 | 1,250 |
| Total | 100,000 | 29,085 | 299,155 |

So that if interest is added to the total AT thus computed it would, after forty years, amount to £299,155. But the AT payable when the distributions actually take place in the fortieth year is:

| | Amount of distribution £ | AT thereon £ |
|-------|-----------------------------|-----------------|
| A | 873,572 | 589,929 |
| B | 150,000 | 67,250 |
| C | 5,000 | 1,250 |
| Total | 1,028,572 | 658,429 |

C is still in the same rate band so that the tax now payable is the same as an inception tax plus 6% (the rate of growth of the fund). In B's case no tax was payable on inception but £67,250 is payable now, whereas in A's case the tax has increased by 7.83% per annum compared with the 6% growth in the fund. Thus the rate of interest which the Revenue receives cannot be less than the rate of growth of the capital of the fund and may be more. In B's case it is not possible to speak of a rate of interest because no inception tax would have been payable. The gain to the Revenue in yield above the 6% level is £359,274 (£658,429 less £299,155).

However, it can be argued that trusts are still too favourable to the taxpayer because, at least in their

more sophisticated forms, they make generation skipping and the allocation of income to different individuals unduly easy as compared with outright gifts. On that view it would be reasonable to increase year by year (counting from the inception of the trust) the rate of AT payable after say the thirtieth year as compared with that which would be payable on an outright gift of the same amount. The scales set out in a later paragraph could be adapted for this purpose by applying the rates appropriate to year one in those scales to withdrawals which take place in the thirty-first year and so on.

The argument needs to be carried a stage further. Suppose that, for the reasons given later in this article it is decided not to apply an AT to income; is it possible to design a withdrawal tax which would compensate for the loss of AT on income? Any attempt to establish a direct correlation with the AT on income actually lost is inhibited by several factors:

- (a) The trustee's investment policy; which may be to seek high, low or intermediate yield and be influenced by non fiscal considerations.
- (b) The need either to compute income tax on income after deducting AT or to compute AT on income after deducting income tax (otherwise taxes on income could readily exceed 100%).
- (c) The fact that the withdrawal tax could not be borne by the recipients of income who must be assumed to have spent their income as they received it. The incidence of the tax must therefore be entirely arbitrary and have no rational basis (it would be computed by reference to the circumstances of recipients of income but be borne by capital beneficiaries).
- (d) The need to take account of the additional AT which may be payable because of growth in capital value.
- (e) The considerable range between the highest and lowest effective rates of AT on income. For example, the table in the following paragraph shows that the effective rate of AT on income in a fund with an income yield of 6% can vary between 0.15% and 3.15% per annum of the value of the fund. If income yields are higher or lower the figures would vary proportionately. A further difficulty is that an annual increase in withdrawal tax of the order of 3% is not feasible; the tax plus such an increase would in many cases exceed 100% well within the life of typical trusts.

If a fund yields a taxable income of 6% (by way of example) the effective rate of AT on net income at various average rates of income tax and AT are as

follows (expressed as a percentage per annum of the value of the fund):

| Average rate of AT on trust income | Average rate of income tax on the top slice of trust income | | | | | | | |
|------------------------------------|---|------|------|------|------|------|-----|-----|
| | 25% | 30% | 40% | 50% | 60% | 70% | 80% | 90% |
| 25% | 1.05 | 1.05 | .90 | .75 | .60 | .45 | .30 | .15 |
| 35% | 1.47 | 1.26 | 1.26 | 1.05 | .84 | .63 | .42 | .21 |
| 45% | 1.89 | 1.62 | 1.35 | 1.35 | 1.08 | .81 | .54 | .27 |
| 55% | 2.30 | 1.98 | 1.65 | 1.65 | 1.32 | .99 | .66 | .33 |
| 65% | 2.73 | 2.34 | 1.95 | 1.95 | 1.56 | 1.17 | .78 | .39 |
| 75% | 3.15 | 2.70 | 2.25 | 1.80 | 1.35 | .90 | .45 | |

If income yields are higher or lower than 6% the change in the foregoing figures would be proportional. High rates of income tax may be due to earned income or to other investment income.

If, therefore, there is to be no AT on income, we think that any compensating increase in the rate of withdrawal tax can only take the form of a small annual increase in the rate of AT compared with that which would be payable on an outright gift of the same amount. We discuss in later paragraphs how such scales could be designed.

The Rudick method

We turn now to the application of AT to income. Professor Harry J. Rudick, Professor of Law at New York University, discussed this subject in articles published in 1945 and 1950.⁴

In the second of those articles his proposals were:

- (a) A withdrawal tax at normal rates.
- (b) AT charged every year on gross income at the rate which would have been applicable if the beneficiary had received an outright accession of the trust fund (or of the proportion of the fund corresponding with the proportion of income received by the beneficiary).
- (c) Income benefits not to enter the AT totals of beneficiaries.
- (d) Income tax charged on income as reduced by AT⁵.

Presumably the value of the fund used in these calculations could be revised periodically (say every ten years) and accessions received by beneficiaries from other sources after the inception of the trust would enter into the calculations for years subsequent to the receipt of those third party accessions.

The effect of these interesting proposals can be described thus:

- (a) The amount received by capital beneficiaries is unaffected by AT applicable to income beneficiaries.

⁴H. J. Rudick, 'A proposal for an Accessions Tax', 1 *Tax Law Review* 25 (1945); What Alternative to Estate and Gift Taxes?, 38 *Californian Law Review* 150 (1950).

⁵Ibid, p. 169.

- (b) The income received by income beneficiaries is the same as that which they would have received had the trust fund been reduced by the AT that would have been paid on a capital accession of a corresponding amount (with some disparity due to the fact that revaluations only take place periodically). The effect on income beneficiaries of a discretionary trust is the same but the rate of AT on income which they paid year by year would vary with and depend on the proportion of the total income of the fund which they received in any particular year.
- (c) Income benefits do not affect the rate of AT paid on other accessions.
- (d) Less income tax is paid.

There are, however, certain difficulties about this method. First, there is the administrative task of assessing every income beneficiary of every trust every year. This would be particularly burdensome in the case of income from discretionary trusts (because the rate would vary every year). Secondly, the omission of income benefits from AT totals can be criticized on two grounds. Substantial income may be received over a very long period and yet not affect the rate of AT payable on other gifts; and administratively the proposal would be a complicating factor in an otherwise straight forward process. Yet it is readily apparent that capital values could not be added to AT totals in the case of income received from a discretionary trust (the whole of the income could be paid to one beneficiary in one year and nothing thereafter). And in the case of a straight forward life interest it is arguable that it is the actuarial value of the life interest, and not the whole fund, which should enter the AT total (and perhaps be used for determining the rate of AT). Thirdly (and perhaps this is the most serious objection to all methods of taxing income to AT) the combined rate of AT and income tax (including investment income surcharge and higher rate tax) may be very high indeed and thus accentuate the existing bias of the tax system in favour of capital gain rather than income.

Professor W. D. Andrews, Professor of Law, Harvard Law School, in an article published in 1967⁶ (which deals mainly with the AT on the capital of trusts) refers to the application of AT to 'all income (including capital appreciation)'⁷. It is not clear whether this includes unrealized capital appreciation. At least in the UK it is difficult to contemplate, whether conceptually or administratively, the payment of AT on unrealized gains.

⁶W. D. Andrews, 'The Accessions Tax proposals' 22 *Tax Law Review* 589 (1967)

⁷Ibid, p. 595 (Andrews)

The alternative Rudick method

Professor Rudick, in his 1950 article⁸ puts forward an alternative method based on actuarial values. The AT notionally payable by a life tenant on the actuarial value of the life interest is expressed as a percentage of the capital of the fund and that percentage of gross income is then paid each year as AT. He is clearly not enthusiastic about this alternative; but does not mention the strongest objection which is that it cannot be applied to discretionary trusts except by assuming that the income of any one year will continue to be paid to that beneficiary. Thus annual actuarial valuations would be required in a trust where the proportions of income going to different beneficiaries varied year by year.

Accessions tax on gross income

This method contemplates that gross income received by a trust beneficiary will enter that person's AT total in the same way as any other accession and be taxed accordingly. Income tax would be paid on the income as reduced by the AT; but administratively it would probably be easier if the AT applicable to one year was used to reduce the higher rate tax and investment income surcharge of the following year. In that event, relief for basic rate tax could be given by paying the AT less basic rate tax on itself.

Administratively this is a good deal simpler than either of the Rudick methods and also easier to explain. But if a beneficiary received trust income regularly the rate of AT on that income (assuming that it was large enough) would, after a time, go up as the AT total passed from one rate band to the next, leading to reduced income. This would not be popular but if, as suggested earlier in this article, withdrawals of capital to supplement income are not taxed as income, legal draftsmen would no doubt soon find ways of supplementing the income from capital if it was thought desirable to maintain a certain level of spendable income.

Accessions tax on net income

However, it may be asked whether it is gross income or income net of income tax which should enter AT totals. If rates of income tax and rates of AT are constant (in other words, if any particular amount of gross income does not bridge two rate bands) it does not immediately matter whether AT is applied to income less income tax or income tax applied to income less AT; the answer is the same either way. But since AT is based on life-time accumulation, whereas income tax is based on annual total income,

⁸Ibid, p. 170 (Rudick)

the accumulation of gross income would in most cases result in a greater tax burden. It seems reasonable that income net of income tax should enter AT totals. This would have the advantage of mitigating the problem of a rate of AT on income which goes up as time goes on. If AT is applied to net income, beneficiaries would bear AT on a figure near to the actuarial value of what they receive (allowing for the difference in timing). This method seems to us to have clear advantages over the other methods of taxing income but unfortunately it is probably less convenient administratively than the application of AT to gross income. Admittedly if, under the latter method, trust income was received in the same year as other accessions, there might be a slight problem in computing the AT applicable to trust income (particularly if the AT total bridges two rate bands). But the application of AT to income net of income tax every year is a more difficult computation. The device of applying AT in year two to the trust income net of income tax of year one would mitigate the problem but not remove it.

Advance Accessions Tax (AAT)

The contrast between an inception tax and a withdrawal tax has so far been discussed in terms of revenue yield and earlier in this article it has been tentatively suggested that the true yield of a withdrawal tax is likely to be greater than that of an inception tax. But there are two further aspects of the deferral problem which need to be examined. Governments may not be enthusiastic about waiting for their revenue (even if the ultimate yield is greater); and if there is no inception tax trusts will appeal all the more powerfully to those who are strongly motivated by the power derived from ownership of certain kinds of assets (e.g., shares in closely controlled companies). If so, this would run counter to one of the purposes of an AT.

Both these considerations point to the desirability of the payment of some advance accessions tax (AAT) on the inception of a trust. In our view any such advance payment is bound to be at an arbitrary rate. Professor Andrews in his 1967 article⁹ put forward some proposals designed to arrive at a crude approximation of the AT which might ultimately be payable but we do not feel able to follow his proposals, not least because they do not extend to inter-vivos trusts. It may well be possible to vary the rate of AAT in sympathy with the aggregate amount settled by one settlor or, more logically, with the amount which is potentially available to any one beneficiary from all trusts established by one settlor. But this becomes complicated and,

even so, ignores amounts accruing to that beneficiary from other sources. We think it is better to have a fairly high arbitrary rate of AAT and for the rate of interest referred to in the next paragraph to be fairly generous (beneficiaries with high rates of income tax or AT will not benefit greatly from such interest). However, if a withdrawal tax is to increase year by year in accordance with the proposals made earlier in this article, then it would seem reasonable, during the lifetime of a trust, periodically to increase the rate of AAT and to apply it to an up to date valuation of the trust.

By our use of the phrase 'advance accessions tax' we have sought to emphasize our view that that tax should not simply be a wholly arbitrary tax which is imposed in addition to a withdrawal tax. Hence it should be credited against any withdrawal tax which ultimately becomes payable and any difference would be paid or repaid. Furthermore, in view of the length of time which may be involved, it is essential that the AAT should carry interest; if this is not done, long lasting trusts will be prejudiced (the amount of AAT credited against a withdrawal in year ten should not be the same as the amount credited against a withdrawal in year eighty). It would, of course, be simpler not to allow interest on AAT and not to escalate the rates of AT with time. But this would not be equitable; to put it in extreme terms, if no withdrawal tax was due when the trust was wound up (because beneficiaries were not liable) then it would be quite unfair only to refund the face value of AAT paid many years before. If interest is to be allowed, there is then a question of what the rate of interest should be. In our view there are three main possibilities:

- (a) A rate which is fixed empirically (perhaps by reference to other long term rates).
- (b) The same rate of growth as is achieved by the trust fund itself.
- (c) The lesser of (a) and (b).

We think that (b) and (c) have attractions in theory but ascertainment of (b) (and hence of (c)) requires a valuation of the fund to be made every time a partial withdrawal of capital takes place. For this reason we think that the rate will have to be fixed empirically.

We have already referred to the strong bias in favour of capital growth which arises if AT is applied to income. However, if AT is not applied to income there is then a bias in favour of income; or more accurately there is then some corrective to the normal bias which the income tax/capital gains tax systems create in favour of capital gain. This gives rise to the suggestion that, if AT is applied to income, interest on AAT should be paid annually and be

⁹Ibid, p. 607

treated as taxable income; while if AT is not applied to income, interest on AAT should be on a compound basis and should be treated as capital gain and so either be subject to capital gains tax or (perhaps less logically) be fixed at a rate which is net of capital gains tax. This proposal would do something to correct the bias one way or the other which stems from the application or non-application of AT to income. If the interest on AAT is paid as taxable income it will be distributed as income and so be subject to higher rate tax and investment income surcharge. But if treated as capital gain it will reduce the income available to life tenants under strict life tenancies. Legal draftsmen may need to evolve new forms to meet the changed circumstances. For example, instead of creating strict life tenancies, settlors and testators may prefer to give to trustees power to pay out of capital to beneficiaries needing regular income an amount equal to, or equal to a specified proportion of, the interest that accrues year by year on AAT. Or a discretionary form may be adopted with an indication to the trustees of the amount of spendable income which it is desired should reach specified beneficiaries, whether drawn out of capital or income.

When withdrawals take place, AAT used to pay the related withdrawal tax will itself be treated as a withdrawal in computing AT. In effect the AAT (and interest thereon if that is treated as capital gain) is an asset of the trust which must, in the first instance, be applied against AT but which can be released to the extent that it can be shown that it is not needed for that purpose (either when partial withdrawals take place or on the winding-up of a trust).

The preferred method

Which method or combination of methods do we prefer, having regard to the objectives set out earlier in this article?

The critical issue is whether AT is applied to income. Of the four methods of applying AT to income it seems to us that AT on net income is the most satisfactory. It taxes people on what they get, when they get it. The method can readily be combined with a withdrawal tax at normal rates or with one which escalates after, say, the thirtieth year. There are, however, powerful objections:

- (a) The combination of AT with income tax aggravates the already strong bias in the tax system against income as distinct from capital gain. The psychological impact of high rates of tax on income (no matter how much they can be justified by rational argument) is detrimental and leads to extreme avoidance measures.

- (b) AT returns with consequent entries in AT records and assessments would be required from every income beneficiary of every trust every year.
- (c) The yearly calculation of trust income net of income tax would be a very considerable burden, particularly as two separate Revenue offices would be involved. Admittedly a good many recipients of trust income have their tax affairs dealt with by professional advisers who could perhaps be expected to do the computations but, even so, the task of checking those computations and of monitoring the effect of subsequent variations in total income for past years would be very heavy.
- (d) The rate of AT on income would tend to go up, in relation to any one income beneficiary, so that net income would go down.

The first two of these objections apply to all the methods of applying AT to income which we have discussed; the third only to AT on net income and the fourth to AT on net income or on gross income. The other methods of taxing income are open to objection on other grounds. We think that the weight of these difficulties is such that no attempt should be made to apply AT to income.

We also reject an inception tax and a periodical capital value tax for the reasons given earlier in this article.

We are then left with the question of whether there is any form of withdrawal tax which would adequately compensate for the fact that AT is not to be applied to income. (Not only is there no AT on the income but the rate of AT on other gifts is unaffected by the receipt of such income.) We have formed the conclusion that a withdrawal tax which escalates year by year from inception, combined with an interest bearing AAT (the interest being subject only to capital gains tax), would meet our objectives more satisfactorily than any other alternative known to us. The proposal lacks the obvious logic of a tax on net income coupled with a withdrawal tax but it has other merits:

- (a) It is simple to administer and understand and not without some rational basis.
- (b) It does not accentuate the bias in favour of capital gain. Indeed it may be that, in some circumstances, the bias in favour of income could be too great but in economic terms it may be no bad thing to have more investors seeking income rather than capital gain. It should not be overlooked that, if income rises, it may involve higher rates of income tax or



alternatively, in a discretionary trust, spreading income benefits more widely in an attempt to avoid those higher rates (and thus in effect spreading the fruits of wealth more widely).

- (c) The initial payment of AAT, coupled with further payments of AAT at intervals as the value of a trust increases and the applicable rate of AAT goes up, makes a significant contribution to Government revenue and reduces the power attaching to ownership of certain types of asset. It is recognized that trustees may borrow to pay AAT but equally they could borrow to pay an inception tax. Furthermore, trustees are often reluctant to borrow because they thereby assume personal responsibility.
- (d) There is no bias in favour of trusts which have beneficiaries with high total income or high AT rates. In fact there may be a bias in favour of those with low rates, particularly if the rate of interest on AAT is fairly generous.

| Normal rate of AT % | Rate of AT (%) on withdrawals from a trust according to the year of withdrawal (specimen dates only) | | | | | | | | | |
|------------------------|---|------|------|------|------|------|------|------|------|--|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | |
| | (years from inception) | | | | | | | | | |
| 25 | 28.0 | 31.3 | 35.0 | 39.1 | 43.7 | 48.9 | 54.7 | 61.1 | 68.4 | |
| 30 | 33.1 | 36.6 | 40.4 | 44.7 | 49.3 | 54.5 | 60.2 | 66.5 | 73.5 | |
| 35 | 38.2 | 41.9 | 45.8 | 50.0 | 54.7 | 59.8 | 65.4 | 71.6 | 78.2 | |
| 40 | 43.2 | 46.8 | 50.6 | 54.8 | 59.3 | 64.1 | 69.4 | 75.1 | 81.2 | |
| 45 | 48.2 | 51.7 | 55.5 | 59.5 | 63.9 | 68.5 | 73.5 | 78.8 | 84.5 | |
| 50 | 53.2 | 56.6 | 60.2 | 64.1 | 68.2 | 72.5 | 77.2 | 82.1 | 87.4 | |
| 55 | 58.1 | 61.4 | 64.9 | 68.6 | 72.5 | 76.7 | 81.1 | 85.7 | 90.6 | |
| 60 | 62.9 | 66.1 | 69.3 | 72.8 | 76.4 | 80.2 | 84.1 | 88.3 | 92.7 | |
| 65 | 67.8 | 70.7 | 73.7 | 76.9 | 80.2 | 83.7 | 87.3 | 91.0 | 94.9 | |
| 70 | 72.5 | 75.2 | 78.0 | 80.9 | 83.9 | 86.9 | 90.2 | 93.5 | 96.9 | |
| 75 | 77.3 | 79.7 | 82.3 | 84.9 | 87.5 | 90.2 | 93.1 | 96.0 | 99.1 | |

The resulting scale may be criticized on the grounds that it results in a yearly rate of increase which is greater in the lower scales than it is in the higher. (If a 75% tax is levied on a first transmission, not very much tax will be levied on subsequent transmissions!) However, if the rate of increase applicable to the 25% band (1.12% per annum) is applied to the 75% band, it would result in a 100% tax becoming payable by the twenty-sixth year. On the other hand, if the rate of increase applicable to the 75% band (0.31% per annum) is applied to the 25% band, it would result in that rate going up over a period of ninety years to only 33.0% compared with 68.4% after four transmissions. However, if this is looked at in terms of what is left after one transmission and what is left after four transmissions, the scale looks more understandable. On the 25% scale the change is from 75.0% to 31.6% (a rate of change of 0.96% per annum); on the 75% scale the change is from 25% to 0.9% (a rate of change of 3.63% per annum).

The scale can also be criticized because there is no direct correlation between the yearly increase in AT on withdrawals and the AT which has not been paid on income. But this is the inescapable result of our rejection of an AT on income. It may also be thought that, because the yearly increase in the rates of AT is small (especially the higher rates) there is a built-in incentive to keep trusts in existence as long as possible. However, that is unlikely to be true of a fund with a growing capital value because that growth will attract progressively higher rates of AT on withdrawals (unless the fund is distributed more widely). Here the existence of an AAT with capital growth is important because it will cause a fund to grow even if the remainder of the fund is static in value. And trustees will not wish to pay the higher rates of AAT suggested in the next paragraph as a fund gets older. We think, therefore, that the scale shown above is a reasonable approach to the problem, although there are no doubt other and perhaps more sophisticated ways of devising a suitable scale.

Having constructed the scales, the question arises of the rates at which AAT should be paid. We lack the statistical resources to make a reasoned judgement but if the rate of interest is high enough we see no

We turn now to the ways in which a scale for an escalating withdrawal tax might be constructed. One approach might be to say that, if a withdrawal took place after thirty years, the AT then payable should leave the same amount for a beneficiary as would have been left if an outright gift of an amount equal to the withdrawal had been subject to AT twice over at the rates applicable to that beneficiary. Thus, if a beneficiary with no previous accessions received a withdrawal of £100,000 thirty years after the inception of a trust, the escalated scale should be designed to leave him with £45,125 (assuming the AT scale to be the same as the present estate duty scale). (The AT payable on £100,000 is £37,250 leaving £62,750; and on £62,750 is £17,625 leaving £45,125.) Then the scale could be extended to achieve the same result as AT applied thrice over if the withdrawal took place at sixty years and four times over at ninety years (about the maximum life for a trust). Rates could then be established for all years from one to ninety. However, this would not give a smooth curve from one to ninety years; the rate of increase in tax would be less in later years than in earlier years. This would not be without some justification because the later rates would be applied to a fund which had itself grown (if only because of interest on AAT). On balance, however, we think a smooth progression is better and this is exemplified in the scale shown below. This has been constructed by taking the tax at ninety years (i.e., after four transmissions) and then arriving at a rate of increase within each rate band which is constant year by year (although the absolute amount of the increase is greater in later years).

harm in an initial rate of say 40%. On that basis we suggest that every twenty years the fund is revalued and additional AAT paid to bring the total AAT up to the following percentages of current value (including AAT and accrued interest thereon):

20 years 45%. 40 years 55%. 60 years 65%.
80 years 75%.

This progression corresponds approximately to the progression of the 40% rate in the scale shown above.

If a large withdrawal takes place and it is of a specified amount (£xxxxxx) rather than a specified fraction of the fund, the process would be as follows:

(a) make an approximate valuation of the investments and other assets and add the AAT, including interest. Express the withdrawal as a fraction of that total (y%).

(b) Compute y% of the AAT including interest.

(c) Compute AT on the withdrawal (£xxxxxx).

(d) The AAT computed at (b) is surrendered less, however, capital gains tax on the interest content. If it exceeds (c) there is a cash refund to the trustees; if it is less than (c) the additional AT is paid by the trustees.

(e) The net withdrawal is paid to the beneficiary (£xxxxxx less (c)).

This process can readily be adapted to situations where the withdrawal is a fraction of the fund (for which the trustees would require an accurate valuation) or where the beneficiary meets the AT himself (in which case the whole of the AAT computed at (b) would be refunded).

An example may be helpful (the referencing follows the steps set out above). Assume a withdrawal of £90,000 to a single beneficiary with no previous accessions:

(a) Value of the fund £100,000. AAT £20,000 paid 10 years ago, with interest at 6% per annum is now £35,817; total £135,817. £90,000 as a percentage (y%) of £135,817 is 66.3%.

(b) 66.3% of £35,817 is £23,734.

(c) AT on £90,000 on the enhanced scales shown above (using the same basic rates as the present estate duty scales):

| £ | Basic rate % | Enhanced rate % | AT £ |
|--------|-----------------|--------------------|---------|
| 15,000 | Nil | Nil | |
| 5,000 | 25 | 28.0 | 1,400 |
| 10,000 | 30 | 33.1 | 3,310 |
| 10,000 | 35 | 38.2 | 3,820 |
| 10,000 | 40 | 43.2 | 4,320 |
| 10,000 | 45 | 48.2 | 4,820 |
| 20,000 | 50 | 53.2 | 10,640 |
| 10,000 | 55 | 58.1 | 5,810 |
| 90,000 | | | 34,120 |

(d) The interest content of the AAT at (b) is £10,481, on which capital gains tax is £3,144 leaving £20,590 (£23,734 less £3,144). Set against the AT of £34,120 this leaves extra AT to be paid of £13,530.

(e) The trustees pay £55,880 to the beneficiary (£90,000 less £34,120). Some trust deeds might also permit the trustees to deduct the capital gains tax of £3,144; this would inevitably happen if the whole fund is being distributed. But in that case the AAT would be computed on £86,856 (£90,000 less £3,144).

The trustees are left with a fund of £30,590 (£100,000 - £13,530 - £55,880) and AAT of £12,083 (£35,817 less £23,734). Because of the payment of capital gains tax the ratio of AAT to the fund is slightly higher at the end of the exercise (28.3%) than at the beginning (26.4%).

If the withdrawal is not large the AT thereon would simply be discharged from AAT held by the trustees (AAT thus used itself counting as a withdrawal). This would result in the trustees holding slightly more or slightly less AAT than they would if the full process was carried out. This would not matter greatly nor would any disparity arising from the approximate nature of the valuation referred to at (a) above.

Our preferred method then is:

(a) Not to apply AT to distributions from a trust which are subject to income tax in the hands of beneficiaries.

(b) Not to treat payments derived from the capital of a trust as income in the hands of beneficiaries, coupled with a rule that would prevent income being accumulated while capital is being distributed.

(c) To alter income tax so that whenever accumulated income is distributed it is liable to income tax in the hands of beneficiaries (with averaging relief if several years' trust income is distributed in one year).

(d) To apply AT to withdrawals of capital from a trust at rates which are higher, year by year counting from the inception of a trust, than those which would apply to outright gifts. A suggested scale is set out in summary form earlier in this article.

(e) To require payment of an advance accessions tax (AAT) on inception at 40% of the then value and every twenty years to require an additional payment of AAT so as to bring the total AAT to an increased percentage of the then current values of the trust. If a fund goes down in value (otherwise than because of withdrawals) no refund of AAT to be made.

The AAT to bear interest which would be free of income tax but be subject to capital gains tax. AAT and interest applied against AT itself to count as a withdrawal.

Examples

The appendix contains some simple examples which tend to show that, in circumstances of the kind postulated, the preferred method gives an end result to beneficiaries which is somewhat less favourable than can be achieved by outright gifts, but not significantly so.

Anti-avoidance measures

If our preferred method is adopted what anti-avoidance measures are needed? We believe that enforcement would be made more effective if the law is altered so that no trust could be created nor any property added to an existing trust except by will or, in the case of inter-vivos trusts, by a validly stamped document. We understand that a general provision to this effect would run into difficulty in the area of implied trusts and resulting trusts; but we think that it may be worth exploring the possibility of defining types of trusts which must be made by a will or by validly stamped document. Because of the provision for an escalating withdrawal tax, any addition to an existing trust would have to be dealt with as if it were a separate trust.

Except where it is necessary to preserve equity between beneficiaries, there may be a tendency to charge expenses against capital and not against income. (Expenses charged against income reduce higher rate tax and investment income surcharge but beneficiaries may not be liable to those taxes.) Any expenses which rank for tax relief at high rates tend to be inflated. Therefore it may be necessary to provide some means by which, in extreme cases, excessive expenses and the division of them between capital and income can be challenged.

If wasting assets (e.g. leases) are made the subject matter of a trust the outcome, in the absence of anti-avoidance measures, would be that neither income nor capital would bear AT. Perhaps it would be sufficient to provide that no refund of AAT would be made to the extent that the value of a trust on distribution was less than on inception. (For example a trust of £100,000 falls in value to £70,000 when it is distributed. AT on £70,000 would be as computed. Three-tenths of the AAT plus interest would be forfeited.) This would also deter trustees from seeking, on purely fiscal grounds, very high income securities. But it could operate harshly in such circumstances as the Rolls Royce failure.

Loans to beneficiaries may have to count as with-

drawals with relief when repayment takes place.

It is possible by judicious drafting of articles of association to create some of the same effects as a trust through the medium of a company. For example, if there are two classes of shares, the A shares can carry 95% of the profit and the B shares 5% of the profit during the life-time of A and the percentages be reversed on his death. Because AT will catch all normal transmissions it would be more necessary than at present to legislate against such devices.

We do not know whether, under the proposed code, it would be necessary to legislate against sales of interests in trusts. We think the new code would make no difference to interests in income; AT would not be payable on it. Sales of interests in capital might be inhibited to some degree because the withdrawal tax could depend on accessions from third parties. A sale of an interest in remainder could be treated as a withdrawal for AT purposes.

No doubt the ingenuity of taxpayers and their advisers would create methods by which trusts could be used to mitigate the impact of AT but the underlying simplicity of AT itself and of our proposals for dealing with trusts are such that it should not be too difficult to deal with such methods without the extreme complexity of other parts of the taxation code. And we are not without hope that the introduction of an AT would itself lead to some change in attitudes to the avoidance of death duties, given a structure which is simple and rational and without the haphazard and random effects of the estate duty code.

Special situations

We deal below with a number of special situations which are common enough to require consideration in this study.

Charities

Consider a discretionary trust for relatives and charitable purposes where both income and capital can be allocated to charity. We think that no AT should be paid on allocations of either income or capital from a discretionary trust to a charity. But we think that AAT should be paid unless the trust is strictly for charitable purposes only. Suppose that, in such a trust, the whole of the capital, including AAT, is allocated to charity; should interest be allowed on the AAT? On the whole we think not (because income may have been paid to relatives who would not pay AT on it). This would be slightly troublesome when only part of the capital is applied to charity. Precautions would still be needed against inflation of income at the expense of capital.

Breaking of trusts

The estate duty code contains complicated provisions designed to prevent the avoidance of estate duty on a trust by breaking it up within seven years of a death which would otherwise attract duty on that trust. In the context of an AT these provisions would not be needed. Beneficiaries would pay AT on what they got when they got it. We think, however, that AT would have to be paid on capital benefits which were renounced by a beneficiary. If this is not done beneficiaries could readily assign benefits to individuals who were not even beneficiaries of the trust so that trusts would become much too simple a device for generation skipping.

Occupation of a house

The fact that no AT is to be charged on income eases what would otherwise be an awkward point when a house in trust is occupied rent free by a beneficiary (or a beneficiary has the enjoyment of a picture).

Annuities created by a will

These should be taxed as income (and not taxed to AT) to the extent that they are paid out of trust income and to the extent that they are paid out of capital should be taxed to AT (and not taxed to income tax). No doubt legal draftsmen will devise ways of providing for annuities free of AT when that is desired by testators. Perhaps the new code could facilitate this by providing in such circumstances that the AT applicable to the annuity of year one (if met out of capital) should itself be treated as a withdrawal in year two. The relationship with AAT would need to be considered.

Other annuities

Covenants in favour of individuals are now much less used than they were but they would come back into favour if they were not brought within the ambit of AT. The amounts received from covenants and any related income tax repayment should be returned as a gift and taxed accordingly. Pension annuities are non-assignable and so should create no AT problems. Annuities used as a means for paying for the acquisition of a business do not constitute a gift and so are not within the scope of AT.

Trusts of life insurance policies

These are quite common. No taxable income arises on the policy as such, but part of the growth in value of such a policy derives from income which has borne tax at the favourable rate applicable to life insurance funds and has not borne higher rate tax or investment income surcharge. If, for example, a

fully paid policy on the life of A is given by A to trustees for the benefit of his widow B if she survives A, otherwise on discretionary trusts for his children, it would seem reasonable that maturity of the policy should be the date from which time runs for the purpose of ascertaining the escalated rate of AT applicable to the policy proceeds. So that, for example, if the policy proceeds are paid to B forthwith on A's death (or on the earlier maturity of an endowment policy) the normal (and not the escalated) scale of AT would be applied. Surrender would be treated as maturity.

If a partly paid policy is settled on similar trusts and subsequent premiums are paid out of income on other investments belonging to the trustees, what treatment should be applied? The effect is that the income is not liable to higher rate tax. A draconian solution may be to treat the income so applied as income of the settlor, in which case the same AT treatment as in the preceding paragraph would be appropriate.

There are, no doubt, other life insurance trust arrangements which need consideration.

Powers of appointment

If property is in trust for A for life and A has a general power of appointment, this is almost equivalent to giving the property to A. There is undoubtedly a case for ignoring the trust and treating its creation as an outright gift to A. But the problem may arise of defining the boundary between general and limited deeds of appointment.

Husband and wife (inter-vivos trusts)

No AT would be payable by a spouse who received income, and nothing but income, from a trust created by the other spouse, but while both spouses are alive the income would of course be aggregated for income tax purposes. Because of this we think that the escalation of the rate of AT on capital withdrawals should only begin with the death of the first spouse to die.

Trusts created by will for infant children and spouses

In our study we have suggested ways of dealing with the special needs of a surviving spouse or infant children with only one or no parent alive. We do not think that any special rules are needed in connection with trusts for such persons particularly as we suggest that AT should not be paid on income.

Non-resident elements

We have not yet made a detailed examination of the special provisions which would be needed to pre-

vent avoidance of AT by use of overseas trusts. However, our tentative conclusions are recorded in the following paragraphs.

The main problem is the treatment of trusts created by persons ordinarily resident in the UK which have non-resident trustees and assets which are situated outside of the UK. The settlor would be accountable for the AAT payable at the inception of such a trust in the same way as we suggest that the donor of an outright gift to a non-resident would be accountable for AT. In the case of a will trust the executors would be accountable. We doubt however whether the same requirement could be imposed in relation to the enhanced AAT which we suggest should be levied at twenty year intervals. Clearly it could not be imposed in the case of a will trust, while in the case of an inter vivos settlement the settlor might have died before twenty years had elapsed: after forty or sixty years he would be more likely to have died than not. In any case he might no longer have the means to pay. It would hardly be practicable, or reasonable, to attach the liability to his heirs, while a charge on the non-resident trustees themselves would be unenforceable. A radical solution might be to make it a legal requirement that all trusts created by persons ordinarily resident in the UK should have at least one resident trustee, who could be made accountable for the enhanced AAT; but such a change in the law would no doubt raise issues going far wider than the AT. Nevertheless it is important to find a practical answer to the problem since, in its absence, the temptation to avoid AAT by creating non-resident trusts would be very great. At present, exchange control would inhibit the adoption of this device, but the trend is likely to be towards the relaxation of exchange controls within the European Community.

The best expedient we can suggest is that the AAT payable at the inception of a non-resident trust should be at a higher rate than that payable in the case of a resident trust, and that there should be no additional charge at twenty-year intervals. As the additional charge on a resident trust will not only take a further levy from the original fund but will apply to the whole of any increase in its value, the higher rate charged at the inception of a non-resident trust should probably be substantially higher than the normal rate in order to compensate adequately for the freedom from any subsequent additional charge.

In so far as beneficiaries of a non-resident trust are ordinarily resident out of the UK the imposition of AAT is probably all that can be done. We envisage, however, that the normal rate of AAT would not be less than the flat-rate AT which we

suggest should be payable on an outright gift to a non-resident and the fact that there will be no AT on capital payments to non-resident beneficiaries is a further factor which could be taken into account in fixing the higher rate of AAT for non-resident trusts.

If the settlor is not within the scope of AT it would be accepted that no AAT would be payable unless the trustees were resident in the UK.

In relation to UK residents who are beneficiaries of non-resident trusts there are two main problems:

- (a) The possibility of evasion of AT by the non-disclosure of capital benefits received from such trusts. However this problem arises generally in relation to accessions from non-residents.
- (b) The possibility of very long perpetuity periods being permitted in some overseas territories with the result that capital remains in trust and does not accrue to beneficiaries in such a way as to attract AT.

Transitional problems

In general withdrawals of capital after the commencement of the AT from a trust set up before the commencement will of course be chargeable to tax, but an exception will have to be made where a capital benefit arising on the death of a surviving spouse would have been exempt from estate duty if estate duty was still in force. In that case the benefit should also be exempt from AT.

In other cases the question arises as to the starting date from which the enhancement of the AT rate should be calculated. As the enhancement is designed to compensate for the freedom from AT of income benefits the starting date should be the commencing date of the AT rather than the inception of the trust, since there would have been no question, if income benefits were charged as such, of charging any such benefit arising before the AT came into force.

Where the trust fund had previously borne estate duty it is arguable that only the normal rate of AT, without enhancement, should be levied, at any rate where the estate duty charge had extended to the whole fund. This would however confer an undue advantage on the trust where income beneficiaries of a discretionary trust died after the commencement of AT, since in such circumstances there will be no AT charge on the remaining (or any new) income beneficiaries corresponding to the present estate duty charge. Moreover, complicated situations would arise where the previous estate duty charge had extended to part only of the fund. The conclusion therefore is that the enhanced rate should apply in all cases

(except the surviving spouse case) where capital is withdrawn after the commencement of AT from a trust set up before the commencement, the rate of enhancement being determined by the length of the period from the commencement of AT to the date of withdrawal.

Conclusion

The application of estate duty to trusts is unsatisfactory. For example, full estate duty on the inception of trusts creating life interests is unduly harsh and competently managed discretionary trusts can still be used to avoid estate duty (e.g. by investing for gain rather than income, then charging expenses against income and allocating the residue of income to charity; or by allocating income to young beneficiaries who can be insured cheaply). Furthermore, the estate duty code in relation to trusts is immensely complex (necessarily so given the basic concepts). We cannot pretend that the rationale of our proposals is immediately obvious but they are simple to understand and apply and difficult to avoid except by spreading wealth more widely. Nor can we confidently assert that the proposed treatment will

always be entirely equitable as between taxpayers of similar taxable capacity or entirely fair as between taxpayers of different taxable capacity. It would require much more time than we have at our disposal fully to estimate the effects of our proposals on the likely actions of settlors and trustees and then to compare the results with those which might have been obtained from outright gifts or from other proposals. But we believe that we have maintained some bias against trusts without making that bias so great as to inhibit the formation of trusts which are justified on non-fiscal grounds.

In many ways we think that the solution which is nearest to a theoretical ideal is an AT on net income with a withdrawal tax which increases after the thirtieth year, coupled with an AAT which bears interest liable to income tax. But as shown earlier in this article there are powerful objections to such a scheme. Although our preferred method is open to criticism on theoretical grounds, we think that it has practical merits and compares favourably with other methods known to us of applying death duties to trusts, whether those take the form of an estate duty, an inheritance tax or an accessions tax.

Appendix

Accessions Tax and Trusts—Examples Introduction

1 This appendix contains examples of two methods of taxing trusts to AT and compares them with the AT which might be payable on outright gifts designed to achieve much the same result. The methods chosen are:

- (a) AT on net income with AAT at 40% on initial capital. The AAT yields 6% taxable income. AT on withdrawals of capital at the same rate as on a gift taking place at the same date as the withdrawal (using the present estate duty scale).
- (b) 'The preferred method', that is to say no AT on income, AAT at 40% on initial capital and an increased rate of AT on withdrawals of capital in accordance with the scale on page 273. The AAT yields 6% gain which is liable to capital gains tax.

2 AT on net income has been chosen for comparison with the preferred method because it has a logical basis (of taxing beneficiaries on what they get when they get it) which would have made it our preferred solution were it not for the objections set not on page 272.

3 One difficulty in making comparisons has already been mentioned (the need to apply compound interest techniques). Other difficulties stem from the choice which investors can make between high present income and low potential capital gain on one hand and low present income with high potential gain on the other. The problem is made worse by the multiple choices which are open to settlors, donors, testators and trustees, particularly in relation to discretionary trusts. Some of those choices will be affected by non-fiscal considerations and, indeed, by influences which are emotional rather than rational. In order to limit the size of this appendix and the calculations required, various arbitrary assumptions have been made. In particular it has been assumed that:

- (a) The currency has a stable value (otherwise rate bands would have to be adjusted to take account of inflation).
- (b) The only available investment media are one yielding 6% taxable income and no gain ('an income stock') and the other with no taxable income but 6% gain ('a growth stock'). These rates are assumed to reflect stable money conditions.
- (c) Personal allowances for income tax are ignored.

- (d) All accumulated income emerging from a trust is liable to higher rate tax.
- (e) Capital used to supplement income is not liable to income tax.
- (f) Capital gains tax is only payable when capital withdrawals take place.
- (g) Beneficiaries have had no accessions from other sources except as shown.
- (h) The AT initial exclusion of £250 per gift is ignored.
- (i) Rates of AT are identical with present estate duty rates.

Gift for a grandchild

4 Assume that a grandparent wishes to set aside a fund of £100,000 for the benefit of a grandchild now aged 1 with the intention that neither capital nor income will be used until age 21. The first set of examples considers what happens if the money is invested in a growth stock and the second what happens if invested in an income stock.

Invested in a growth stock

5 If the £100,000 is given to the parent as nominee (or bare trustee) for the grandchild it would bear AT at inception as an outright gift. This would take £37,250 and leave £62,750 which invested in a growth stock would grow in 20 years to £201,248 which after bearing capital gains tax would leave £159,699. (Capital gains tax would only have to be paid if the fund had to be realized.)

6 If instead the gift is deferred until the grandchild is 21 (assuming the grandparent to live so long) it would meanwhile grow to £320,713 which after bearing capital gains tax of £66,214 would leave £254,500 on which AT would be £137,900, leaving £116,600.

7 Should an AT on net income be in operation the establishment of a trust for the grandchild (whereby his interest would be dependent on attaining age 21) would involve payment of AAT at inception of £40,000. This would yield taxable income of £2,400 which, net of income tax, would be £1,620 per annum. Over the 20 years this would amount to £32,400 and involve AT of £5,090. If the income net of income tax and AT is accumulated at (say) 3% it would amount to £37,677. The balance of the fund (£60,000) if invested in a growth stock and after payment of capital gains tax would become £152,700 which plus the AAT of £40,000 becomes £192,700. AT on £192,700 is £95,005, leaving £97,695. Adding the accumulated income gives £135,372. (The accumulated income would earn less

than 3% if invested in an income stock: more if invested in a growth stock. In practice the choice would be somewhere in between.)

8 But if the preferred method is in operation the AAT of £40,000 would yield 6% gain. Since this is the same as the rate of growth of the rest of the fund (if invested in a growth stock) the fund would grow to £320,713, less capital gains tax £66,214, leaving £254,500 (as in paragraph 6) on which AT at the enhanced rates shown under year 20 in the scale on page 273 would be £152,249. Thus the fund after payment of AT would be £102,251.

Invested in an income stock

9 If, however, the investment medium is an income stock the subjective choice of an appropriate rate of compounding becomes more important. As before an immediate gift would involve AT at inception of £37,250 leaving £62,750 which would remain at that value for the 20 years if invested in an income stock. The income on £62,750, net of income tax, is £2,371 which accumulated at (say) 3% would amount to £63,710. Adding the capital of £62,750 gives a fund of £126,460.

10 Deferment of the gift until 21 would (if it was invested meanwhile in an income stock) be very disadvantageous. The grandfather's income on £100,000 net of income tax at a top slice tax rate of (say) 50% would, if accumulated, amount to £80,611; add the £100,000 and deduct AT on the total of £180,611 leaves £93,464. In practice the grandfather's top rate of income tax would probably be in excess of 50%.

11 With an AT on net income in operation the income net of income tax would be £3,500 which over 20 years amounts to £70,000 and invokes AT on income of £21,250. (Income on AAT is at the same rate and taxable in the same way as that on the income stock.) If the income net of income tax and AT is accumulated at 3% it would amount to £68,117 which added to the capital of £62,750 (£100,000 less AT on withdrawal £37,250) gives a total fund of £130,867.

12 The preferred method would attract AAT on inception of £40,000 (yielding 6% gain) and the balance of £60,000 would yield 6% taxable income. The income net of income tax amounts to £2,280 which accumulated at 3% becomes £61,264. The AAT grows to £128,285; less capital gains tax of £26,485 it becomes £101,800. Add the £60,000 of income stock gives £161,800 on which AT at enhanced rates is £84,258 leaving £77,542. With the accumulated income the fund is £138,806.

Summarising

13 On the assumptions the ending Fund becomes:

| | Invested in a growth stock £ | Invested in an income stock £ |
|----------------------------------|------------------------------------|-------------------------------------|
| Outright gift at age 1 | *159,699 | 126,460 |
| Outright gift at age 21 | 116,600 | 93,464 |
| Trust (with AT on net income) | 135,372 | 130,867 |
| Trust (with preferred method) | 102,251 | 138,806 |

14 If, however, 4% is used for compounding income instead of 3%, the figures become:

| | Invested in a growth stock £ | Invested in an income stock £ |
|----------------------------------|------------------------------------|-------------------------------------|
| Outright gift at age 1 | *159,699 | 133,354 |
| Outright gift at age 21 | 116,600 | 93,464 |
| Trust (with AT on net income) | 139,799 | 139,195 |
| Trust (with preferred method) | 102,251 | 145,436 |

In this context 4% can probably be justified as an appropriate net yield from a growth stock (which would be available as a means of investment for accumulated income, even although the trust fund itself was invested in an income stock).

15 It should be noted that under both trust methods the yield on AAT has been taken as the same as that on the income and growth stocks. This was done in order to eliminate any difference arising from any differential rate. In practice the yield on AAT could be less than that obtainable on non-government stocks (because of less risk) or more (if the bias against trusts is too great).

16 The example demonstrates that, on the assumptions, if the preferred method is in operation the fund would normally, if given outright, be invested in a growth stock and be invested in an income stock if put in trust.

17 An AT on net income is not considered in the remainder of this appendix as it is thought that the most important comparison is between outright gifts and trusts under the preferred method.

Gifts to two beneficiaries

18 Assume that a donor wishes to set aside a fund of £50,000 for his sister and nephew. He wants his

sister to have £2,000 a year spendable income for ten years (when other resources will become available to her) and the rest to go to the nephew who becomes 18 in ten years time. He is content to proceed by gift or trust and, if by gift, assumes that the nephew would accumulate any income until he becomes 18. The sister has had previous accessions of £15,000; the nephew has no income. She has a pension of £1,000 per annum and investment income of £2,000.

19 The donor first considers an outright gift and assumes that it would best be invested in a growth stock. At worst it would yield 4.2% (6% less capital gains tax) compared with 3.3% in an income stock (6% less 45% income tax). In fact the gain from the growth stock would be better than 4.2% because capital gains tax would not be payable on the whole sum every year. At 4.2% yield, £2,000 per annum for ten years requires an initial fund of £16,061 – say £16,000. If he gives her £23,077 AT would be £7,077, leaving £16,000 which would give her rather more than £2,000 a year to spend.

20 This leaves £26,923 (£50,000 less £23,077) for the nephew on which (as an outright gift) AT would be £3,227 leaving £23,696. This invested in a growth stock would in ten years become £42,436 which if then realized would invoke capital gains tax of £5,622 leaving £36,814.

21 If, however, the £50,000 is put in trust it is probable, assuming the preferred method to be in operation, that investment in an income stock would be preferable. It is an open question whether it is better to allocate income to the sister or the nephew. If the former, she will pay 45% income tax on the income but the supplement needed from capital will be less and so invoke lower rates of AT on the capital thus given to her. If the income is allocated to the nephew he would only pay 30% income tax and he would have a lower AT total. However, it is decided, perhaps mistakenly, to allocate the income to the sister, who is expecting a substantial accession in ten years' time.

22 The process of administering the trust then involves making up the sister's spendable resources to £2,000 by drawing on capital, paying AT on the amount thus drawn plus the AT itself, paying the AT out of AAT and receiving a refund of the AAT not then required.

There is no capital gains tax on the capital withdrawn because it comes from realization of the income stock. (The gain on the AAT is assessed for the purpose of this example at the end of the trust, although in theory it ought to be assessed year by year on AAT used or refunded). At the end of ten

*If capital gains tax is paid at age 21; £201,248 if not. But if not paid there is a bigger contingent liability.

years the unused AAT is £26,337 and £21,540 of the income stock is left, a total of £47,877. The gain on the AAT has been £13,845 giving capital gains tax of £4,154 leaving £43,724 on which AT at enhanced rates is £10,139 leaving £33,585 compared with £36,814 in paragraph 20.

Discretionary trusts

23 Even in the previous example there was a choice as to whom income should be allocated to achieve maximum fiscal advantage; yet, in spite of the simple nature of the example, it was by no means obvious which was the best alternative. In discretionary trusts (for example, for the issue and spouses of the issue of the parents of the settlor) the range of choices open to trustees in allocating income and capital is so large that it is difficult to do a

monetary example. Furthermore, it cannot be assumed that non fiscal considerations can be ignored in making such allocations. The two previous examples show that the preferred method is somewhat less advantageous than early outright gifts. In part that is due to the fact that trusts defer the time at which capital reaches beneficiaries; if capital is growing that is bound to invoke more AT. The imposition of an AAT which carries interest in capital form ensures that there is growth. The second reason why the preferred method is less advantageous is the enhanced rates of AT shown on page 273. If those enhanced rates lead to capital being spread more widely that will serve the purpose of the tax; if income is spread more widely in order to reduce the impact of income tax that too will serve the purpose of the tax.

Financial Disclosure in relation to a Firm's Capital Costs

Frederick D. S. Choi

Increasing disclosure of information by means of general publication must be accepted as the essential prerequisite of the maintenance and further development of any efficient capital market and should be the chief aim of any legal and institutional policy.

Gerald D. Newbould - 1967

The question of improving financial reporting and disclosure has been handled to date by and large as a matter of public policy. Governmental and professional groups interested in the relationship between financial disclosure and capital market efficiency have made applicable policy determinations in this regard. The basic premise of these groups is that somehow more disclosure is preferable to less. While policy efforts in the area of financial reporting and disclosure improvement are to be applauded, and despite recent empirical studies on the subject of disclosure improvement,¹ no conceptual framework is available at present for purposes of relating the question of financial disclosure to capital market effects. As a consequence, asserted relationships between accounting development and capital market development have not benefited from the support of deductive logic and remain in the realm of opinion and speculation - a less than desired state of affairs.

The purpose of this paper is to set forth a conceptual framework which will contribute to and stimulate further research on the subject of financial disclosure and capital market effects. The relationship between improved corporate financial disclosure and efficient capital markets is explored via the effect of improved

disclosure on a firm's capital costs.² The general conclusion emanating from the discussion is that a conceptual framework which relates disclosure improvement and cost of capital is demonstrable and supports the existence of a direct relationship between firm value and corporate disclosure.

Investment Decision-making

Notwithstanding the minimum standards of corporate financial disclosure insisted upon by the principal capital market institutions in various countries, it would appear that a major force encouraging improved disclosure by borrowing enterprise-investors relates to the fact that large and successful corporations not only compete with each other for access to the limited reservoirs of money capital but that each also strives to obtain such money capital as cheaply as possible. While there are a variety of forms in which competition for scarce money capital could manifest itself, improved corporate disclosure practices would appear to be a logical vehicle.³

The cost and availability of external funds to a

²Cf. Kleinman: '... from the point of view of a company, disclosure would be useful if it lowered the cost of capital - i.e., raised the stock price ... The criterion of lower capital cost ... is of sufficient importance that more research is desirable on the relation of added disclosure to lower capital cost.' Ibid., p. 53.

³Cf. Chambers: '... disclosure ... is the response of management to the demands of other groups. The merits and deficiencies of any published statements do not have to be judged by accounting standards, but by what becomes necessary in view of the attitudes of and the relationships between different groups in a community. R. J. Chambers, 'Disclosure is a Matter of Managerial Policy, Not Accounting Doctrine', *Journal of Accountancy*, (August, 1951), p. 223. 'Information about the company is one of the conditions being imposed more and more by the sophisticated supplier of capital or their advisors. Institutional investors and the analysts of financial houses are contributing to the pressures.' Herman Bevis, *Corporate Financial Reporting in a Competitive Economy* (New York: The Macmillan Company, 1965), pp. 9-19.

¹For example see: Surrendra S. Singhvi and Harsha B. Desai, 'An Empirical Analysis of the Quality of Corporate Financial Disclosure', *The Accounting Review* (January, 1971), pp. 129-138; James C. Stallman, 'Toward Experimental Criteria for Judging Disclosure Improvement,' *Empirical Research in Accounting: Selected Studies, 1969*, a supplement to Volume 7 of *The Journal of Accounting Research*, p. 53.

borrowing enterprise-investor are, in most instances, the outcomes of a myriad of investment decisions. Decisions, if they are to be rational, should be based on relevant information. The specification of the relationship between financial disclosure and a firm's capital costs must, therefore, begin with a discussion of the investment decision process and the effect of improved disclosure on investment decisions.⁴

An investment decision may be defined as any decision in which the choices available to the decision-maker involve a sacrifice of present consumption with the expectation of receiving increased consumption streams in the future. One can call the increased future stream generated by a financial asset its 'dividend stream', where the term refers here to any monies paid to the holder of a security as a consequence of ownership. This money stream may include such things as regular cash distributions which bear some proportion to the size of the investment commitment, liquidating dividends or interest, and whatever else the firm decides to pay or is obligated to pay the holder now and in the future.

Investment behaviour under uncertainty

In a world of perfect certainty, the selection of financial assets would be simple as all securities would provide some uniform risk-free return. In general, however, returns from financial assets are subject to degrees of uncertainty. To conceptualize investor decisions under conditions of uncertainty, we begin

our analysis by setting forth several initial assumptions describing the perceptions and attitudes of consumer-savers towards choices involving risk.⁵

First, the investor regards the returns to himself from acquiring a share of stock (bond) as a combination of the periodic dividends he would be entitled to receive each period of his investment horizon and the price at which he could liquidate the shares or bonds at the end of that horizon. Because of uncertainty, the investor sees these returns as expected values of the subjective probability distribution he forecasts. That is, he sees the after tax dividend the share will generate for him in any period as the expected value which we denote, \bar{d} , of the probability distribution of possible after tax dividend which he forecasts for that period. He sees the after tax liquidating price of the share at the end of some period as the expected value, which we denote, \bar{v} , of the probability distribution of possible after-tax liquidating prices which he forecasts for the end of that period.

Second, the investor uses some measure of the dispersion of a security's expected returns, e.g., the standard deviation of expected dividends, σ_d , the standard deviation of expected liquidating share prices, σ_v , etc., and the correlation of those returns with those of other securities as measures of the risk associated with the security.

Third, the individual's preference which his choice from among alternative investment opportunities must satisfy are such that:

- (1) he prefers a higher expected return for any given standard deviation of return, covariance of return, etc., and
- (2) he prefers a lower standard deviation of return for any given expected return, covariance of return, etc.

Established theory of investment decision-making under uncertainty

Investment theorists generally agree that a security's value is positively related to its expected dividend streams and inversely related to the riskiness associated with those return streams. In the case of a single security, the standard deviation, or some general measure of dispersion, of a security's expected return

⁴The term financial disclosure will be defined here as the publication of any economic information relating to a business enterprise, quantitative or otherwise, which facilitates the making of investment decisions. Economic information, in turn, is any datum that reduces the uncertainty about the outcomes of future economic events. Finally, improved disclosure, as defined here, involves the manifestation of an increase in the quantity and quality of economic information disclosed by the business enterprise via its financial statements. Whereas the definition adopted here implies that the quality of information increases commensurately with quantity, this need not be the case. A preliminary investigation into this intriguing subject is contained in the author's dissertation. It is posited that, in theory, there exists an economic limit to disclosure value and hence disclosure improvement. Until such a limit is reached, however, it may be said that the value or quality of disclosure is positively correlated with the quantity of disclosure. Although it is argued that such a theoretical limit exists, the writer is not concerned where that limit is. For it is presumed that firms competing for access to the limited reservoirs of money capital would never consciously exceed that limit for fear of adverse consequences on their capital costs. Thus, within the range of disclosure level concerned here, it will be assumed that quantitative increases in disclosure will not involve net disbenefits to the firm. See: Frederick D. S. Choi, 'Financial Reporting and Disclosure in Relation to Broadly Based Capital Markets', (unpublished Ph.D. dissertation, University of Washington, Seattle, Washington, 1972), Appendix B.

⁵The following draws on the work of Markowitz and others who have made substantial contributions in the area of investment behaviour under conditions of uncertainty. For example see: Harry M. Markowitz, *Portfolio Selection* (New York: John Wiley and Sons, 1959); and James Tobin, 'Liquidity Preference as Behavior Towards Risk', *The Review of Economics and Statistics* (February, 1958), pp. 65-86.

streams is commonly cited as a measure of a security's riskiness.⁶ Portfolio theorists, however, argue that such is not the case when a security is combined into a portfolio of securities. Emphasis, instead, is placed on the covariance of a security's return with those of another security or portfolio of securities.⁷ Some have interpreted this to imply that a security's own standard deviation of returns is no longer an important measure of risk for individual investors.⁸

In the appendix to this paper, we demonstrate that: (1) the value of a security in a capital asset pricing context can still be related to its own standard deviation of returns, σ_d and σ_v , (2) the value of a security in a capital asset pricing context is inversely related to σ_d and σ_v , and (3) σ_d and σ_v are important.⁹

Improved disclosure and investment decisions

In elaborating the relationship between improved disclosure and a firm's capital costs the following additional assumptions will be made. First, it is assumed that an individual will currently value a security on the basis of: (1) his current utility determined value function, (2) his expectations regarding future dividends from the security he is concerned with, (3) his expectations with regard to the present and future prices and dividends of all other securities in the market, and (4) his current wealth constraints. Expressed symbolically:

$$(1) V_i = f(\bar{d}, \sigma_d, \bar{v}, \sigma_v, \bar{v}', \sigma_{v'}, w)$$

where V_i = value of a security to an individual

d = dividends to investors from the security over an investor's holding period (the bar over each variable signifies expected value)

v = future market value vector of the security, e.g., $v = (v_1, v_2, \dots, v_\infty)$ where v_t is the market value of the given security in period t

v' = value vector of alternative assets available in the market

w = individual's wealth endowment

⁶See: Markowitz op. cit., p. 14 and Frederick S. Hillier, 'The Derivation of Probabilistic Information for the Evaluation of Risky Investments', *Management Science*, (April, 1963), pp. 443-487.

⁷See: William F. Sharpe, *Portfolio Theory and Capital Markets* (New York: McGraw Hill Book Co.), pp. 96-97.

⁸For example see William Beaver, Paul Kettler, and Myron Scholes, 'The Association Between Market Determined and Accounting Determined Risk Measures', *The Accounting Review*, (October, 1970), pp. 657-659.

⁹In that discussion $d + v$ are combined into a total return stream, X , for convenience, i.e. $X = d + v$.

σ = the standard deviation, or some general measure of dispersion, of the subjective probability distributions of the related variables, d , v , and v'

f = current utility determined value function.

As the future market value vector (v) of the security that an investor is concerned with can be shown to be functionally related to the expected dividend streams beyond the investor's holding period, d' , expression (1) can be rewritten as:

$$(2) V_i = f(\bar{d}, \sigma_d, \bar{d}', \sigma_{d'}, \bar{v}', \sigma_{v'}, w)$$

For purposes of simplicity we can then combine the dividends expected to be received during the investor's holding period, d , with d' and define the entire dividend stream as D . Thus, $d + d' = D$. Expression (2) can thus be expressed more compactly as:

$$(3) V_i = f(\bar{D}, \sigma_D, \bar{v}', \sigma_{v'}, w)$$

Within the context of large existing securities markets, some of the variables in the preceding demand function of the individual for a security could be eliminated as not being related to disclosure regarding that security. In other words, disclosure by a company issuing a given security should not have any appreciable effect upon the person's utility function, the price or returns on all other securities and assets in the market, or the individual's wealth constraints. In fact, the only variables that disclosure regarding a given security will affect directly are d and v in equation (2) and therefore D in equation (3).

Dividends and capacity to pay

It is further assumed that the distribution of D depends upon the distribution of the firm's expected income stream, Y . Regarding expected dividends, it can be said that the dividend return has a probability distribution in the mind of the individual. That is, the individual appraises the future and associates certain probabilities with each level of dividend returns in each future period. These dividends may be pictured as being related to the capacity and willingness of the firm to pay dividends over time. The capacity and willingness of the firm to pay dividends, in turn, are related to the expected level of income and financial position of the company.

It can also be said that the dispersion of the subjective probability distribution of dividends in this person's mind is directly related to the dispersion of the distribution of income of the firm. That is, if the individual is less certain about the expected level of corporate earnings he is going to be less certain about what the future dividend stream will be. Further-

more, it could be assumed that whatever the variance of the conditional distribution of dividends given income is, $\text{Var}(\text{DIY})$, and whatever it is a function of, the distribution of dividends will become less disperse as the distribution of expected income becomes less disperse. The foregoing thus implies that (4) $\bar{D} = f(\bar{Y})$ and (5) $\sigma_D = h(\sigma_Y)$.¹⁰

Expectations and information

On the basis of our earlier discussion it is asserted that for any given set of investors with particular utility functions and wealth constraints, the determinant of a security's value at any point in time is investor expectations regarding the returns from the security. The firm income expectations, \bar{Y} , of consumer-savers in any wealth class are, in turn, a function of several kinds of data. These data relate to the performance of the company, the industry of which a firm is a part, and general economic factors. More specifically let:

I_i = a vector of information about firm i which includes past performance data such as company earnings, dividends, cash flows, debt levels, and all past accounting data associated with firm i up to the present time.

$I_N = \sum_i I_i$ = a vector containing all of the information about the industry of which firm i is a part and representing the cumulative result of aggregating the data of all the individual firms in a given industry.

I'_i = a vector of information on firm i which is not directly related to the past or present accounting information about firm i , e.g., information relating to the securing of future sales contracts, mergers, etc.

I'_N = a vector of information on the industry of firm i not related to the aggregation of firm accounting information, e.g., rumours that federal legislation will benefit or harm the industry of firm i , etc.

β = a vector of all other information about the economy, in general, that could have a bearing on the value of firm i .

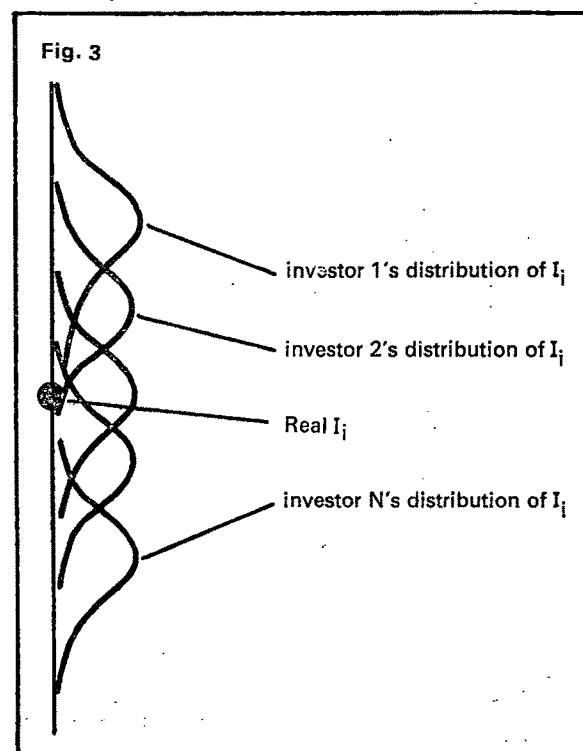
Given an individual consumer-saver who owns some of the securities of firm i in industry N , the information set in the mind of this individual is defined as ${}_jI_{iN}$, where the latter refers to a vector of financial information relating to the firm, industry, etc., of firm i in industry N in the mind of individual j . Each

${}_jI_{iN}$ is, in turn, a set of distributions of data relating to the individual firm, its industry, and the general economy, i.e., ${}_jI_{iN} = ({}_j\hat{I}_i, {}_j\hat{I}_N, {}_j\hat{I}'_i, {}_j\hat{I}'_N, \hat{\beta})$ where \wedge means "distribution of". Accordingly, it is presumed that the distributions of income, \hat{Y} , in the mind of the individual are dependent upon the distributions of these information vectors. Thus, (6) $\bar{Y} = t({}_jI_{iN})$ and (7) $\sigma_Y = u(\sigma_{{}_jI_{iN}})$.¹¹ As the value of a firm's shares is a function of investor expectations about firm performance which is, in turn, a function of information regarding the individual firm in question and its environment, the value of the firm can be redefined in terms of the information used. Thus, the predisclosure value of a firm i is assumed to be a function of the distribution in the mind of investor j of all the previously mentioned information vectors. Symbolically,

$$(8) {}_jV_{iN} = K({}_j\hat{I}_i, {}_j\hat{I}_N, {}_j\hat{I}'_i, {}_j\hat{I}'_N, \hat{\beta})$$

Expectations and unbiasedness

Each of these information vectors can be thought of as possessing true values for its individual components. Thus, firm i does possess a certain level of earnings, cash flow, debt, etc.; and the industry and economy (β) has some actual aggregate level of performance. The individual consumer-saver, of course, does not know what these true values are and thus entertains estimates of their probable dimensions. This is illustrated in Figure 3.



¹¹The consideration of possible interdependencies will again be dropped for purposes of simplicity.

¹⁰While some dependency may conceivably exist between \bar{D} and σ_Y and between σ_D and \bar{Y} , such interdependencies will be ignored for purposes of simplicity.

For purposes of exposition, these information variables are defined such that the higher the level of the I_i 's and I_N 's, the better the firm and industry. That is, I variables are defined such that an increase in their numerical values can be viewed as a positive thing and conversely. Thus, if earnings are viewed as good, then an increase in their level will be represented by a higher level of I . If debt is viewed as bad, then we will define its surrogate as inversely related to debt.¹²

Figure 3 illustrates the difficulty experienced on the part of various individuals in estimating the true value of a firm's accounting variables. Individual 1, for example, tends to be overly optimistic while individual N tends to underestimate the true level of I_i . Although such a dispersion of estimates is to be expected in an uncertain world, it will nevertheless be assumed that historically people, in the aggregate, tend to have unbiased estimates of firm accounting variables. That is, if we were to take everyone and average the means of their individual distributions for any accounting variable, we would obtain a mean of means hereafter referred to as the grand mean. It is presumed that this grand mean would, on the average and over time, equal the true accounting variable.¹³ This suggests that, historically, people are as likely to be correct in their expectations as incorrect. Although the grand mean for any single year may not be correct, on the average and over time, it will be so that it can be said to be an unbiased estimate of the true accounting variable.¹⁴ This implies that whether a firm is better or worse than the industry average, in terms of performance, when it reveals more information about itself it can expect that investors are not going to be disappointed *on the average*.¹⁵

¹²For example, if a high debt equity ratio is viewed as bad, we could define I as $(1/\text{debt equity ratio})$; an increase in I will therefore occur if the debt ratio is reduced and conversely. This enables us to speak of a company as being above the industry average if its I_i vector is above the industry average.

¹³The foregoing discussion, including the distribution depicted in Figure 1, applies to individuals in the same 'market power' class, k . For purposes of this discussion, participants in the market for a firm's securities will be viewed as comprising various 'market power' classes. Each class represents a different level of current and potential purchasing power and, hence, possesses a different potential to influence the market value of a firm's securities. Accordingly, it is presumed that estimates of firm accounting variables are unbiased within each market power class.

¹⁴Viewed from another perspective, if an individual were to query everyone in a given investor class and obtain the means of their subjective distributions of the earnings of firm i for a given year and average them, he would derive the grand mean of those means. If he were to do this for a number of years and were to estimate the difference between this estimate and the true value of a firm's earnings, he would obtain an error for each year. This error has a distribution whose expected value is zero as the grand mean is an unbiased estimator.

We said earlier that the value which an individual imputes to a company's equities is a function of the various firm, industry, and market information variables available to him. Now the relative weights which an individual places on each of these information variables in assessing a security's investment value is presumed to be dependent on the confidence which he places on each information type. Thus, if an investor is suspicious of firm i 's accounting data, I_i , but is quite confident of the validity of the industry data, I_N , then he places more weight on the latter data to guide his investment behaviour with respect to that firm. On the other hand, if he is convinced that the firm data he receives is very good relative to that of the industry, he can be expected to be less concerned with industry statistics than information about the firm. Consequently, in appraising the future performance of the enterprise, an investor probably relies less heavily on industry information than on firm information if his confidence in the former is less than his confidence in the latter.

When a firm improves its disclosure, data about itself should become more reliable. An individual can thus place greater weight on such data in making judgements with respect to the firm. Consequently, if a firm is better than the average and knows that the information released is better than industry statistics, then it would always be in its favour to increase the weighting which investors place upon I_i relative to I_N . In short, it would be to its competitive advantage for a company which is better than the industry to distinguish itself from the average firm comprising that industry.

Now say that a better than average firm increased its disclosure and that the information revealed is close to what people had expected. While such information may not be surprising in that it is close to the mean of everyone's expectations, investors are now less uncertain about their decision variables than before. That is, the variance of their subjective distributions is lowered which would, in terms of our

¹⁵While some may question such assertions, it is difficult to justify the opposing argument that investors, in general, tend to be biased in their estimates of firm data. It is not clear for example how one could justify saying that investors are generally downward biased with respect to their expectations regarding a firm which is better than the average in an industry. Such a situation would only occur, prior to improved firm disclosure, to the extent that individuals place an inordinate amount of weight on industry data which would tend to depress their prediction with regard to firm i . Thus, assume that prior to disclosure improvement, company statistics about the present and the past provide an investor with a certain picture about firm i , but that industry statistics appear very depressing. Under these circumstances the investor is very likely to value the company less than if the converse were true.

earlier discussion, exert a positive bias on share valuations.

The additional effect of a reduction in the dispersion of investor's subjective estimates, however, is that such individuals would now place greater credence on these estimates than before. The more credible the information the more weight would be placed on it. Investors would thus place a higher value on the shares of firm i , which is above the industry average.

To elaborate the foregoing argument, additional assumptions are made explicit below:

1. Each investor has an information set jI_{IN} , where the latter refers to a vector of accounting information about a firm i in industry N in the mind of individual j . Each jI_{IN} is, in turn, a set of distributions of data relating to the individual firm, its industry, and the general economy, i.e., $jI_{IN} = (jI_i, jI_N, jI_Y, jI_N, \beta)$.
2. The average value estimate which an individual places on firm i , $j\bar{V}_{iN}$, is a function of the average of the information estimates regarding the firm in that industry,¹⁶ e.g., \bar{I}_i is equal to the grand mean of the mean estimates of all

investors, i.e., $\bar{I}_i = \frac{\sum j\bar{I}_i}{m_i}$ while σ_{I_i} is equal to

the standard deviation of the distribution of the means of the various I_i 's. Expressed symbolically,

$$(9) j\bar{V}_i = f(j\bar{I}_i, j\bar{I}'_i, j\bar{I}_N, j\bar{I}'_N, j\bar{\beta}, j\bar{I}_Y, j\bar{I}'_Y, j\bar{I}_N, j\bar{I}'_N, j\bar{\beta}) \text{ where } j\bar{I}_i = \text{"the mean of } I_i\text{"} = \int jI_i$$

$P(jI_i) d_j I_i$ and the grand mean is $\bar{I}_i = \sum \frac{j\bar{I}_i}{m_i}$.

The term m_i refers to the number of investors in firm i .

3. It follows that if there is no change in any of the arguments in valuation equation (9) then there is no change in the valuation of the firm. In short, the arguments in this equation define all the variables associated with the valuation placed on the equities of the firm in question.
4. Equations (3)-(9) are well behaved and differentiable.
5. Investor's estimates are as likely to be above the real I as below it, i.e. - over time, investor expectations are distributed symmetrically above and below the real I .
6. All new corporate disclosures are unbiased

information; or, more generally, such disclosures originate from a known information system that may have understandable biases. Thus, rational adjustments of one's decision-priors is possible.

Effects of improved disclosure on information and value expectations

With the foregoing assumptions in mind, a central question is how changes in a firm's disclosure levels affect investor's information expectations which, in turn, affect the value of the disclosing firm's securities. This is our present inquiry.

We said that the value of a firm's securities are a function of the distribution of expected dividends, \hat{D} , which were, in turn, functionally related to the distribution of a firm's income streams, \hat{Y} . \bar{Y} , however, was said to be dependent upon the information provided, \bar{I} . The latter refers to expected information regarding firm, industry, and economy performance variables, i.e., $\bar{I} = m(I_i, I_i', I_N, I_N', \beta)$. The foregoing dependencies which were stated earlier as equations (3) - (7) can be combined and expressed symbolically in the form:

$$(10) V_i = \phi\{r[s(\bar{I})]\}.$$

The analysis of a change in disclosure upon the value of a firm i can be facilitated by use of functional differentiation and the chain rule of calculus. Differentiating expression (10) first with respect to \bar{I} and then with respect to σ_I yields:

$$(11) dV_i = \left(\frac{\partial V_i}{\partial \bar{D}}\right) \left(\frac{\partial \bar{D}}{\partial \bar{Y}}\right) \left(\frac{\partial \bar{Y}}{\partial \bar{I}}\right) d\bar{I}$$

$$(12) dV_i = \left(\frac{\partial V_i}{\partial \sigma_D}\right) \left(\frac{\partial \sigma_D}{\partial \sigma_Y}\right) \left(\frac{\partial \sigma_Y}{\partial \sigma_I}\right) d\sigma_I$$

Evaluating the terms in expression (12) first, we can argue that $\frac{\partial V_i}{\partial \sigma_D} < 0$ as a security's value was defined

to vary inversely with respect to the "riskiness" of the expected dividend streams, as measured by σ_D . Increased uncertainty with regard to a firm's expected income streams, by assumption, will be associated with increased uncertainty with respect to the dividend expectations in the minds of investors. Thus,

$\frac{\partial \sigma_D}{\partial \sigma_Y} > 0$. \bar{Y} was said to be dependent upon the distribution of financial information available to investors,

jI_{IN} . Accordingly the less reliable the information regarding the determinants of a firm's reported earnings, the greater the uncertainty that is likely to be associated

with the firm's expected earnings, i.e., $\frac{\partial \sigma_Y}{\partial \sigma_I} > 0$.

¹⁶The industry subscript, N , will hereafter be omitted as the following analysis will be confined to firms in a given industry

With increased disclosure there is, by assumption, no change in the distribution means of the I 's in the minds of investors on the average. Hence $\Delta I = 0$ as a consequence of any mean changes since the means do not change. In other words, investors on the average are neither disappointed nor overly pleased by improved disclosure. Their views tend to be confirmed on the average as the information estimates of investors were assumed to be unbiased, e.g., $E(I_i) = I_i$ where \bar{I}_i is the average investor's estimate of firm accounting variables which has a distribution that is historically an unbiased estimate of I_i .

However, although investors are neither disappointed nor surprised on the average, they become more sure of their estimates. That is, the standard deviation (variance) of their estimates of firm variables goes down. Accordingly, $\Delta\sigma_I < 0$ as we also assumed that all new disclosures provide information about a firm which is unbiased. This leads us to the following conclusion.

C-1. Increased firm disclosure implies no change in the average estimation of the firm's accounting variables, i.e., $\Delta I_i = 0$ but tends to lower the dispersion of that estimate, i.e., $d\sigma_I < 0$.

By C-1 and assumption 2 on page 287, there is a positive effect on the current value estimate of a firm's securities, e.g., $dV_i > 0$ because improved firm disclosure will not disappoint investors in terms of the average of their estimates. Improved disclosure will, however, reduce the dispersion of their estimates. Hence, the effect of a reduction in σ_I on the value of the firm, via expression (12) on page 287, will be for V_i to rise.

In evaluating the terms of expression (11) on page 287, we can argue that an increase in the level of expected dividends, \bar{D} , will cause the value of a

firm's shares to rise, i.e., $\frac{\partial V_i}{\partial \bar{D}} > 0$. Recall that security valuation models were defined to be positively related to the level of expected dividends. Higher income expectations, in turn, will be associated with higher expected dividend levels, i.e., $\frac{\partial \bar{D}}{\partial \bar{Y}} > 0$. This follows

from our earlier assumption that the level of \bar{D} is positively related to the level of \bar{Y} . Finally, an increase in the value of firm information, I , will be associated

with a higher \bar{Y} , i.e., $\frac{\partial \bar{Y}}{\partial I} > 0$. This follows as I variables were defined such that an increase in their numerical values is viewed as a positive thing and conversely, i.e., higher I 's are associated with improved expected performance statistics.

The next question of interest is the effect of improved disclosure on I . It can be argued that dI is positive for certain types of disclosure. More specifically, improvements in financial disclosure by a firm which outperforms the industry will cause I to rise. The reasoning underlying this assertion is that I depends not only upon the level of I_i and I'_i but also upon the weighting of I_i and I'_i relative to I_N , I'_N , and β . While the content of increased firm disclosure may not be surprising in that it is close to the means of everyone's expectations; nevertheless, investors would now be less uncertain of a firm's financial statistics i.e., the variance of their estimates of firm variables goes down. Such individuals could now place more credence on I_i and I'_i than before and, by assumption, the more credible the information the more weight would be placed on it. Thus, for firms which are viewed as better than the industry, improved disclosure – increased information about the past and future determinants of a firm's sales, earnings, cash flows, debt levels, etc. – will cause \bar{I} after disclosure to exceed I before disclosure i.e., $d\bar{I} > 0$. This is accomplished by increasing the relative weighting of the more favourable firm statistics relative to the other information vectors which investors use in forming their expectations with respect to their security investments. This leads us to another conclusion.

C-2. With a rise in disclosure, the I_i (past and present accounting data associated with a firm) becomes more important in the mind of an investor than I_N (industry accounting data) as firm i produces better information relative to other firms. But we know that $I_i > I_N$ and $E(\bar{I}_i) > I_N$ as firm i was assumed to be better than the industry average. As a result, the more favourable firm statistics, I_i , become more important in the minds of investors. This, in turn, tends to have a positive effect on the firm's value relative to the other I 's as investors would now weigh the more favourable I_i more heavily than I_N causing $dI > 0$. By expression (11) on page 287 a positive change in \bar{I} will cause $dV_i > 0$.

For firms that are equal to the industry average, $I_i = I_N$ and $E(I_i) = I_N$. Thus, while increases in firm disclosure may increase the relative weighting of I_i relative to the other information vectors, it will not have any appreciable effect on V_i . However, improvement in disclosure does reduce the dispersion of investors' estimates. Hence, firm value should still rise as V_i was shown to vary inversely with σ_I .

Implications of the foregoing analysis regarding the

security value of firms which are below the industry average are not as clear cut. Improved disclosure may cause V_i to fall by changing the relative weighting which investors place on I_i relative to the other I 's, given that $I_i < I_N$. We have also shown, however, that σ_I should fall with improvements in disclosure thus causing an upward bias in V_i . Conclusions regarding which of the two effects would exert a dominating influence on V_i would probably depend upon the degree to which the firm's performance trailed that of the industry.

Capital market effects of improved disclosure

According to the foregoing model, then, improved firm disclosure will entice an individual to alter the amount paid for a given security. Higher security prices, for example, would mean that a primary security issue could be priced higher and, other things the same, would increase the net proceeds available to the firm. Or, for any given issue price, the investor would be willing to purchase a larger number of shares given his present stock of investible funds. In either case, the firm would experience larger receipts from a given issue and hence experience a lower capital cost.

Summary and concluding remarks

It has been shown that a conceptual framework for viewing the question of disclosure improvement and capital market effects is demonstrable. This is accomplished in the following manner. It is argued that increased firm disclosure tends to improve the subjective probability distributions of a security's expected return streams in the mind of an individual investor by reducing the uncertainty associated with that return stream. For firms which generally outperform the industry average, it is also argued that improved financial disclosure will tend to increase the relative weighting which an investor will place on favourable firm statistics relative to other information vectors which he utilizes in making judgements with respect to the firm. Both of the foregoing effects will entice an individual to pay a larger amount for a given security than he would otherwise, thus lowering a firm's cost of capital.

The conceptual framework presented here is intended as an initial step towards a theory of the capital market effects of improved financial disclosure. Accordingly, it is not without its limitations. For

example, the framework presented above does not deal with the question of arriving at the optimum information set, I_i . If additional disclosure is preferable to the existing state of financial reporting, because the dispersion of investors' subjective expectations is reduced, one would expect a firm to reduce that variance to a very small number. Incorporation of this added dimension into the model would necessitate a consideration of the additional costs as well as the benefits of improved disclosure. In limiting the scope of this presentation the author also chose to ignore the question of the social value of disclosure improvement. Whether firm benefits of added revelations are consistent with the value of disclosure to society in general is intriguing to say the least.

Limitations notwithstanding, the establishment of a direct relationship between firm financial disclosure and the cost of capital opens up a new dimension in accounting research. In addition to research efforts aimed at improving upon the theoretical formulation presented here, studies designed to verify empirically or refute the proposed theory are also in order. For example, empirical testing of hypotheses derived from the foregoing model requires that accountants operationalize the elusive concept of disclosure improvement. Extensions of the work by Cerf¹⁷ and Singhvi¹⁸ would appear fruitful in this regard. The effects of improved disclosure could then be conducted in either a primary or a secondary capital market setting. In view of the rather developed state of the U.S. capital markets and the forthrightness of American financial reporting, future studies could also be conducted in lesser developed environments utilizing any one of a variety of financial disclosure media.¹⁹ Examples such as these are but a sampling of research opportunities that await exploitation by accountants with an interest in the relationship between financial disclosure and capital market development.

¹⁷Alan R. Cerf, *Corporate Reporting and Investment Decisions* (Berkeley, California; Public Accounting Research Program, 1961).

¹⁸Singhvi and Desai, op. cit.

¹⁹The results of an empirical study designed to test an implication of the theory presented here is contained in the author's dissertation cited earlier. A summary of the test methodology and principal findings has been submitted for publication. Evidence for the study was obtained from an examination of changes in disclosure practices of a sample of corporate borrowers entering an unregulated capital market where costs of financing are relatively lower than most national markets. Findings of the study suggest that firms entering such a market significantly improve

Appendix

Demonstration of the Consistency Between the Single Security Partial Equilibrium Model and the Single Period Capital Asset Pricing Model

To show that the value of a security in a capital asset pricing context is still inversely related to its own standard deviation of total returns, $\sigma_{X_i} = \sqrt{\sigma_{X_i}^2}$, where $X_i = d_i + v_i$ (page 291), let us recall that the rate of return on any perpetual security, R_i , is simply the ratio of its actual returns, X_i , to its present value V_i . Hence:

$$(1) R_i = \frac{X_i}{V_i} - 1$$

in an uncertain world, we can rewrite (1) as

$$(2) V_i = \frac{E(X_i)}{1 + E(R_i)} \text{ where } E \text{ stands for the}$$

expected value operator of a random variable.

Now the expression for the expected return of a security in the capital asset pricing context may be stated as:²⁰

$$(3) E(R_i) = r_f + \frac{E(R_M) - r_f}{\text{Var}_{R_M}} \text{Cov}(R_i, R_M) \text{ where}$$

$E(R_M)$ = the expected return from an efficient portfolio of securities, Var_{R_M} = the variance of the rate of return associated with the market portfolio, and $\text{Cov}(R_i, R_M)$ = the covariance between the return on security i with the return on the market. It is merely a numerical value which measures the degree to which the returns of both portfolios covary together. r_f = the pure rate of interest.

Substituting (3) for the denominator of equation (2):

$$(4) V_i = \frac{E(X_i)}{1 + r_f + \frac{E(R_M) - r_f}{\text{Var}(R_M)} \text{Cov}(R_i, R_M)}$$

Letting $\lambda = \frac{E(R_M) - r_f}{\text{Var}(R_M)}$ and substituting (1) for R_i in (4)

$$(5) V_i = \frac{E(X_i)}{1 + r_f + \frac{\lambda}{V_i} (\text{Cov}(X_i, R_M))} \text{ since}$$

$$\text{Cov}\left(\frac{X_i}{V_i} - 1, R_M\right) = \text{Cov}\left(\frac{X_i}{V_i}, R_M\right) = \frac{\text{Cov}(X_i, R_M)}{V_i}$$

Multiplying both the numerator and the denominator of the right hand term in equation (5) by V_i

$$(6) V_i = \frac{E(X_i) V_i}{V_i + V_i r_f + \lambda \text{Cov}(X_i, R_M)}$$

Dividing both sides of the foregoing expression by V_i yields:

$$(7) 1 = \frac{E(X_i)}{V_i + V_i r_f + \lambda \text{Cov}(X_i, R_M)}$$

Solving for V_i ,

$$(8) V_i = \frac{E(X_i) - \lambda \text{Cov}(X_i, R_M)}{1 + r_f}$$

Now the rate of return on the market portfolio, R_M is equal to the ratio of its expected returns, X_M , to the market value of that portfolio, V_M , i.e., $R_M = \frac{X_M}{V_M}$.

X_M , in turn, being the summation of the expected returns of the individual securities of which it is comprised, can be expressed $X_M = \sum_j X_j$. Substituting $R_M = \frac{X_M}{V_M}$ into (8)

$$(9) V_i = \frac{E(X_i) - \lambda \text{Cov}\left(X_i, \frac{X_M}{V_M}\right)}{1 + r_f} \\ = \frac{E(X_i) - \frac{\lambda}{V_M} \text{Cov}(X_i, X_M)}{1 + r_f}$$

The covariance term in (9) can be rewritten

$$(10) \sum_{j=1}^n \text{Cov}(X_i, X_j) \text{ since } X_M = \sum_{j=1}^n X_j$$

Now when $j = i$, $\text{Cov}(X_i, X_j)$ simply becomes the variance of X_i , $\sigma_{X_i}^2$. Thus the covariance term in (10) can be expressed

$$(11) \sigma_{X_i}^2 + \sum_{j \neq i} \text{Cov}(X_i, X_j)$$

Substituting (11) for the proper term in (9)

$$(12) V_i = \frac{E(X_i) - \frac{\lambda}{V_M} \sigma_{X_i}^2 + \sum_{j \neq i} \text{Cov}(X_i, X_j)}{1 + r_f}$$

Equation (12) states, as before, that the value of an individual security is a function of the risk free rate r_f and some measure of risk. However, now it is not only a function of the covariance of its returns with those of the other securities in the market portfolio, but also the variance of its own expected returns, $\sigma_{X_i}^2$. (12) also implies that the value of security is inversely related to its own variance of returns.

There is a difference of opinion, however, as to the significance of $\sigma_{X_i}^2$. The arguments in (12) imply that $\sigma_{X_i}^2$ becomes trivial for large portfolios. Accordingly, many investment theorists feel that the only relevant measure of a security's total risk is that portion which

²⁰Sharpe, op. cit., p. 90.

measures the covariances of its returns with those of the market.

To demonstrate that $\sigma_{X_i}^2$ is important we reintroduce equation (12) for further examination.

$$(12) V_i = \frac{E(X_i) - \frac{\lambda}{V_M} \sigma_{X_i}^2 + \sum_{j \neq i} \text{Cov}(X_i, X_j)}{1 + r_i}$$

Now $\text{Cov}(X_i, X_j)$ can be re-expressed as $\rho_{iM} \sigma_{X_i} \sigma_{X_j}$ where ρ_{iM} is a quantitative expression which measures the correlation between the X_i and X_j , $\sigma_{X_i} = \sqrt{\sigma_{X_i}^2}$, and $\sigma_{X_j} = \sqrt{\sigma_{X_j}^2}$.

When this alternate expression for the covariance term is substituted in equation (12) we can think of an investor's problem as one of having to estimate not only ρ_{iM} but σ_{X_i} as well.

With increased disclosure by firm i , the correlation between R_i and R_M should not change.²¹ The covariance will change, however, because of the fall in the variance of firm i 's return stream. For example, figures 1 and 2 below illustrate the correlation between X_i and X_j both before and after increased disclosure by firm i . In both cases, the correlation coefficient is -1 . However, in the latter case, the variance of firm i 's income is lower and thus the covariance of X_i and X_M (depicted here as σ_{ij}) is lower.

²¹It seems reasonable to argue that ρ_{iM} is a more stable characteristic of the firm than σ_{X_i} . For instance, when a firm's ρ_{iM} is low, such a firm is said to be 'defensive.' (Sharpe, op. cit. p. 93). Firms which possess this trait would be those in the food, tobacco, liquor, and other industries in which demand tends to be relatively price inelastic. In general, firms within such a classification tend, on the average, to maintain such postures over time. Similarly, when a firm's ρ_{iM} is high, it is usually characterized as being cyclical in nature. Firms in industries such as the steel and heavy equipment industries are a few examples which suggest themselves. In general these categories also tend to persist over time.

Of course, the correlation coefficient may fall anywhere from -1 to $+1$. However, the same principle holds i.e., the correlation coefficient is unaffected by the disclosure. Thus, improved disclosure not only lowers σ_{X_i} but also lowers σ_{ij} for all j . The implication to be drawn here is that improved disclosure is a dominating influence on firm value.

To elaborate, let X_i = returns of security i , X_j = returns of security j , variance of X_i = σ_i^2 , standard deviation of X_i = σ_i , variance of X_j = σ_j^2 , standard deviation of X_j = σ_j , covariance (X_i, X_j) = σ_{ij} , correlation (X_i, X_j) = ρ_{ij} . Assumptions regarding the effect of improved disclosure on the foregoing variables are:

1. Improved disclosure by firm i will cause σ_i^2 and, hence, σ_i to fall.
2. Improved disclosure will not affect ρ_{iM} since the correlation coefficient merely reflects the relative directions of covariation between two variables.
3. Improved disclosure does not affect σ_j^2 and hence, σ_j .

Assuming further that $\rho_{ij} = \bar{\rho}_{ij}$ (a given value before and after disclosure).

$$(13) \bar{\rho}_{ij} = \frac{\sigma_{ij}}{\sigma_i \sigma_j}$$

Rearranging (13)

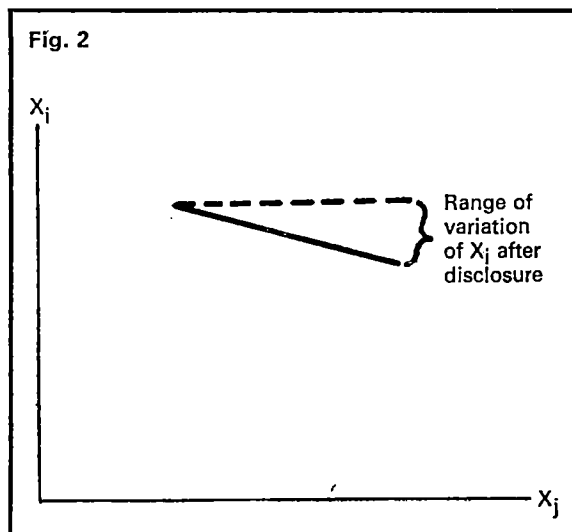
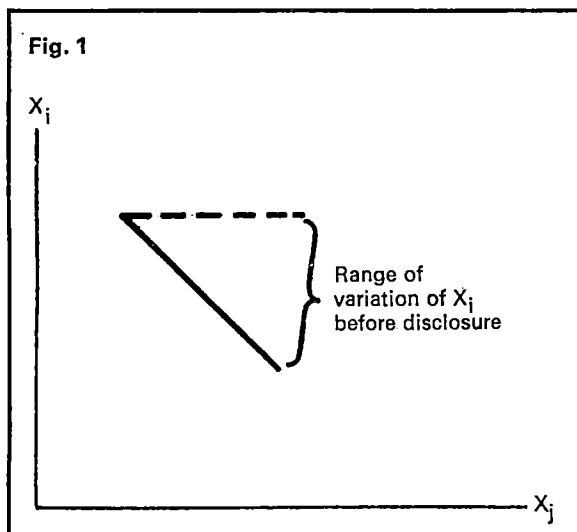
$$(14) \sigma_{ij} = \bar{\rho}_{ij} \sigma_i \sigma_j$$

If firm i improves its disclosure, σ_i will fall. Differentiating expression (14)

$$(15) d\sigma_{ij} = (\bar{\rho}_{ij} \sigma_j) d\sigma_i$$

and for $d\sigma_i < 0$, $d\sigma_{ij} < 0$.

The foregoing arguments imply that σ_i is important. Rather than continuing with *a priori* arguments, let us consult the evidence. To begin with, there does not



seem to be any conclusive empirical evidence that realized rates of return can be explained by or are very sensitive to the degree of correlation with the market. The evidence seems to suggest, however, that realized rates of return are statistically related to their own variance of returns.²² Haley²³ in regressing rates of return on measures of σ_i and $\rho_{iM}\sigma_i$ found that a security's rate of return was more highly correlated with its own standard deviation of returns, σ_i , than those of the market.²⁴

King²⁵ found that over time, the proportion of the variance of a typical security's rate of return attributed to market fluctuations has declined. This suggests that securities are being valued more on their own individual merits than formerly.

While the benefits of risk reduction via security diversification is not to be denied, it has been shown that investors, on the average, tend to under-diversify again suggesting that a security's own variance of returns is an important component of a security's risk.

²²For example see: Fred Arditti, 'Risk and the Required Rate of Return on Equity', *Journal of Finance* (March 1967), pp. 19-36.

²³Charles F. Haley, 'Risk in The Capital Market', Unpublished manuscript, University of Washington, Seattle, Washington (1972).

²⁴Coefficients for the $\rho_{iM}\sigma_i$ variables were, in most cases, approximately equal to zero, whereas coefficients of σ_i variables tended to be fairly large and statistically significant.

²⁵Benjamin King, 'Market and Industry Factor in Stock Price Behavior'. *The Journal of Business* (January, 1966), pp. 139-190.

Pricing and Distribution in an Inflationary World

F. B. Pizzala

Introduction

Much of the recent discussion on accounting for inflation has failed to take an overall approach on how the problem of inflation logically interacts with other financial aspects of business problems, the subject has been approached in an ad hoc and therefore arbitrary manner, and the objectives of inflation accounting have never been fully spelt out but rather regarded as self evident in as much as inflation is a problem that needs to be taken account of. Thus the arguments put forward for various ways of accounting for inflation have failed to link this subject logically to policies regarding distributions, retentions, replacement, technical progress, price and future investment. This paper examines these topics, illustrates their interdependence and how this affects the decisions made by companies when they consider the whole topic of accounting and inflation¹.

When a company involves itself in an investment it involves itself in forecasting either expressly or by implication. Such forecasting exhibits itself in:—

- (a) the prices that are charged;
- (b) the dividends that are paid;
- (c) the sums accumulated by way of depreciation to replace the investment;
- (d) the incidence of this accumulation year by year; and
- (e) the length of time over which it will occur.

While the company cannot avoid tackling these topics it frequently approaches them in a piecemeal way, and therefore makes arbitrary or implied forecasts for these items separately which will be inconsistent

with one another. The manner in which the various topics mentioned are inter-related and the requirements (on a theoretical level at least) for consistent forecasting can be demonstrated by considering initially depreciation and pricing policy and then linking them up with retentions and distribution policy, and then with inflation.

While traditional methods of depreciation may be adequate for some purposes, they are wholly inadequate for some of the major purposes for which they are deployed. Frequently, a firm's written down assets combined with its annual depreciation charges are used as a basis for compiling long term product costs and hence prices; for this purpose the arbitrary incidence of the depreciation charges computed in accordance with one of these traditional methods renders them quite unsuitable. Instead the 'economic' value of the organisations assets must be taken into consideration. Unfortunately, the calculation of a series of consequent 'economic' depreciation charges is dependent upon a knowledge of the future cash flows and, therefore, prices; the problem is circular to this extent. It follows that since the incidence of the 'economic' depreciation charge is determined by price, it is a fundamental error to believe that a firm could arrive at the 'economic' price via an arbitrarily based system of depreciation such as the 'straight line' method. Such systems presume in effect, a certain pattern of cash flows which may be quite different from the actual flows expected of the plant and quite different from the cash flows explicitly assumed in the original appraisal of the investment.

It is not suggested that this 'economic' depreciation be adopted for general accounting purposes as the calculations would be complex. Nevertheless, if the problem of circularity could be overcome they would be necessary if product costs, as a basis for pricing, were to be determined on the basis of the written down value of the organisation's assets. If

¹ In order to illustrate the basic inter-relationship we have kept the model simple by ignoring problems of taxation, working capital and gearing. In addition, discussion regarding pricing later in the paper refers to a trend pattern and ignores cyclical fluctuations in trade and other causes of market supply/demand disequilibrium.

we assume perfect foresight we can illustrate the significance of an 'economic' depreciation policy and we can show that the results of this policy, so far as pricing is concerned, will be consistent with pricing based on new and future investments².

If a company is to account for inflation it will need to revalue its assets by some means. Various methods have been suggested; for example, the valuation may be based on the costs of any one of the following:—

- (a) the replacement of an identical asset;
- (b) the cost of the modern equivalent of the original asset;
- (c) the historic cost of the asset up-dated by a general price index.

The correct choice will depend upon the specific objectives of the company. Nevertheless, if a major objective is for a firm to assess how much it needs to retain to keep its *productive* capacity intact then (b) must be the correct choice. Again (b) must be the correct choice for pricing policies since product costs must be related to their own production costs—not some general index of costs. Finally (c) is ruled out on logical grounds, since the 'real' value of assets based on (c) can give meaningless rates of return for non-depreciating assets. Therefore, a company that uses (a) or (c) risks making incorrect forecasts for depreciation, pricing and hence retentions and distributions.

The Problem of Inadequately Charged Depreciation on Existing Assets

On the first revaluation to account for inflation, there will be a shortfall between the historic depreciation that has been charged and the sum that should have been charged had allowances for inflation been operative from the date of purchase of the plant; this shortfall might not be recoverable out of future profits.

The problems associated with the potential liability of generating extra funds to cover inflation may not be too serious. As inflation takes place and new plant is introduced both within existing firms and by newcomers to the industry, prices will increase over what they would have been to reflect the current cost of plant, otherwise the new investment would not be worthwhile. While if the inflation unexpectedly speeds up prior investments will earn an unexpected surplus; and conversely. Moreover since firms have

to give shareholders a 'reasonable' return and service debt, prices will have to be adequate for these purposes. However, while these factors suggest that even without specific allowance for inflation, firms could well realise an adequate return on their investments³ they may well distribute in dividends more than they would have if they had specifically allowed for the increasing money cost of replacing plant. This might force them to go to the market for fresh funds more frequently than they would like. Though it is likely that any organisation going through a phase of major expansion or investment will have to raise funds from outside the business. Moreover, if circumstances allow, most firms like to retain a significant proportion of their earnings and this could well cope with the inflation.

Technical Progress

The impact of inflation on the cost of new plant might be at least partially offset by the fact that new plant is technically superior to older plant and hence, inflation apart, will produce the same output more economically. Real prices based on future plant costs will therefore be lower than those based on current plant costs so that in real terms prices will decline. If this is not allowed for in the pricing policy, prices will initially be set too low. Profits on existing plant might be further squeezed as a result of ageing, i.e. its operating costs might tend to increase in real terms due to wear and tear. Alternatively, there may be commercial pressure for a gradual improvement in the quality of the firm's products over time, i.e. technological progress may exhibit itself in the form of an improved product at an unchanged price, rather than the same product at a lower price and this will result in a need for higher retentions, to purchase the plant required. There will still be a declining profit margin on production from existing plant as prices will have to be lower for it to remain competitive or extra money spent in order to improve the quality. Technical progress will also be reflected in economies arising from the introduction of superior operating and organisational techniques and these will not depend upon significant new investment. Other things being equal, this would lead to an improvement in profits. But, in practice other things might not be equal and the improved operating might be reflected in lower prices, depending upon competitive conditions.

² For those interested, a formal proof is included in the Appendix at the end of the paper; it is not necessary to read this to appreciate the main theme of the exercise.

³ The fact that company profits have been severely squeezed between 1960 and 1970 has nothing to do with inflation as such; the trend is just as strong whether real returns or conventional returns on assets are examined. Therefore, even without specific accounting for inflation adjustments the trends could be clearly seen.

The Significance of 'Economic' Depreciation

The idea of economic depreciation may be considered a highly theoretical construct; nevertheless, it can be used to demonstrate the link between returns on capital, pricing, retentions and distributions. It is only after illustrating this theoretical base that we will be in a position to pass judgment on the effects of using arbitrary depreciation methods, and if we find these inadequate to attempt to overcome these inadequacies. Since many enterprises use the straight line method of depreciation this is compared below with the economic method of depreciation.

The problem is initially illustrated in Table 1, assuming there is no inflation. The first column shows a project's cash flows assuming a 15% DCF return and constant profits for 15 years, the second column shows the discounted cash flows of this project.

The third column shows the total value of the future discounted cash flows at the end of each year; for example; at the end of year 10 the table shows that the discounted value of the subsequent cash flows in years 11 to 15 is £57.32 or:—

$$\frac{17.1}{(1.15)} + \frac{17.1}{(1.15)^2} + \frac{17.1}{(1.15)^3} + \frac{17.1}{(1.15)^4} + \frac{17.1}{(1.15)^5}$$

These values represent the 'economic' written down book values of the project in each year and from these we can derive the annual depreciation charges shown in column 4, being the difference between the yearly written down values. Column 5 compares the straight line method with the economic method. It can be

seen that the economic depreciation charge starts off at less than one third of the straight line charge and finishes at over twice the amount. The most relevant consequence of economic depreciation is that it gives a net profit after depreciation in each year when expressed as a rate of return on net capital employed that equals the DCF yield of the project. Thus if depreciation (column 4) is deducted from the gross profits (column 1) and divided by the written down value of the asset at the beginning of the year (column 3) the rate of return is 15% in all years⁴.

A further example of the economic method of depreciation is given in Table 2. In this example profits are assumed to decline linearly to zero over 15 years, and again to show a DCF yield of 15%. The figures in columns 2 to 4 are derived in exactly the same way as in Table 1. Again it can be checked that when economic depreciation is used in the calculations profits after depreciation divided by the written down value of the capital at the beginning of the year equals the project's DCF yield in each year.

The project shown in Table 2 displays a trend of declining profits which may well be the typical pattern. In this example the initial depreciation charges are significantly higher than those given by the straight line method. This result is compared with the straight line method in Table 3, which shows that the return on capital employed steadily declines and becomes negative in the last few years of the project's life.

⁴ Small deviations occur with the figures due to rounding errors in the discounting tables.

Table 1. Methods of Depreciation: Constant Profits

| Year | Cash Flows | P.V. of annual Cash Flows at 15% DCF | Future P.V. of Cash Flows at Year's end | Annual Depreciation Econ. Method | Straight Line |
|-------|------------|--------------------------------------|---|----------------------------------|---------------|
| | (1) | (2) | (3) | (4) | (5) |
| 0 | —100.0 | —100.000 | 100.000 | | |
| 1 | 17.1 | 14.870 | 97.898 | 2.102 | 6.667 |
| 2 | 17.1 | 12.930 | 95.481 | 2.417 | 6.667 |
| 3 | 17.1 | 11.244 | 92.701 | 2.780 | 6.667 |
| 4 | 17.1 | 9.778 | 89.504 | 3.197 | 6.667 |
| 5 | 17.1 | 8.503 | 85.828 | 3.676 | 6.667 |
| 6 | 17.1 | 7.394 | 81.601 | 4.227 | 6.667 |
| 7 | 17.1 | 6.429 | 76.739 | 4.862 | 6.667 |
| 8 | 17.1 | 5.591 | 71.148 | 5.591 | 6.667 |
| 9 | 17.1 | 4.862 | 64.719 | 6.429 | 6.667 |
| 10 | 17.1 | 4.227 | 57.325 | 7.394 | 6.667 |
| 11 | 17.1 | 3.676 | 48.822 | 8.503 | 6.667 |
| 12 | 17.1 | 3.197 | 39.044 | 9.778 | 6.667 |
| 13 | 17.1 | 2.780 | 27.800 | 11.244 | 6.667 |
| 14 | 17.1 | 2.417 | 14.870 | 12.930 | 6.667 |
| 15 | 17.1 | 2.102 | 0.000 | 14.870 | 6.667 |
| Total | 156.5 | 0.000 | not relevant | 100.000 | 100.000 |

Table 2

| Year | Cash Flows | P.V. Earnings at 15% DCF | Future P.V. Earnings at Year's End | Annual Depreciation, Year's End | |
|-------|------------|--------------------------|------------------------------------|---------------------------------|---------------|
| | | | | Econ. Method | Straight Line |
| | (1) | (2) | (3) | (4) | (5) |
| 0 | -100.000 | | 100.000 | | |
| 1 | 24.554 | 21.378 | 90.415 | 9.585 | 6.667 |
| 2 | 22.945 | 17.349 | 81.034 | 9.381 | 6.667 |
| 3 | 21.306 | 14.008 | 71.885 | 9.149 | 6.667 |
| 4 | 19.667 | 11.245 | 63.003 | 8.882 | 6.667 |
| 5 | 18.028 | 8.964 | 54.424 | 8.579 | 6.667 |
| 6 | 16.389 | 7.085 | 46.200 | 8.224 | 6.667 |
| 7 | 14.750 | 5.544 | 38.377 | 7.823 | 6.667 |
| 8 | 13.111 | 4.286 | 31.024 | 7.353 | 6.667 |
| 9 | 11.472 | 3.262 | 24.205 | 6.819 | 6.667 |
| 10 | 9.833 | 2.431 | 18.002 | 6.203 | 6.667 |
| 11 | 8.195 | 1.761 | 12.508 | 5.494 | 6.667 |
| 12 | 6.555 | 1.225 | 7.828 | 4.680 | 6.667 |
| 13 | 4.916 | 0.799 | 4.086 | 3.742 | 6.667 |
| 14 | 3.277 | 0.463 | 1.423 | 2.663 | 6.667 |
| 15 | 1.638 | 0.201 | 0.000 | 1.423 | 6.667 |
| Total | 96.666 | 100.000 | not relevant | 100.000 | 100.000 |

Table 3. Profit Ratios: Straight Line Depreciation, Declining Profits

| Year | Written Down Capital | Profit Less Depreciation | % Return on Written Down Capital |
|------|----------------------|--------------------------|----------------------------------|
| 1 | 100.000 | 17.917 | 17.9 |
| 2 | 93.333 | 16.278 | 17.4 |
| 3 | 86.666 | 14.639 | 16.9 |
| 4 | 80.000 | 13.000 | 16.3 |
| 5 | 73.333 | 11.361 | 15.5 |
| 6 | 66.666 | 9.722 | 14.6 |
| 7 | 60.000 | 8.083 | 13.5 |
| 8 | 53.333 | 6.444 | 12.1 |
| 9 | 46.666 | 4.805 | 10.3 |
| 10 | 40.000 | 3.166 | 7.9 |
| 11 | 33.333 | 1.528 | 4.6 |
| 12 | 26.666 | (0.112) | (0.4) |
| 13 | 20.000 | (1.751) | (8.6) |
| 14 | 13.333 | (3.390) | (25.4) |
| 15 | 6.666 | (5.029) | (75.4) |

For an industry as a whole that is continually investing at a steady rate the difference between the two "returns on written down capital" will not be as extreme as in the illustrations since the errors on the different projects will have a *tendency* to cancel out. However, for a new firm or for an industry going through a phase of major expansion, the use of the straight line method of depreciation could give rise to a highly misleading 'return on capital employed', and it would not provide a useful basis for pricing or distribution policy. Moreover, conventional methods of depreciation completely fail to take account of the fact that many projects have a construction period of several years, followed by several more years before full production is achieved. The construction and

commissioning periods can have just as critical an impact on 'full cost' prices as the shape of the project's profit stream. This is fully accounted for in the economic method of depreciation which automatically capitalises these factors⁵.

Multiple Rates of Return on Project

Different projects will have different DCF yields (i.e. internal rates of return) so that if each project is considered to earn a zero present value for purposes of calculating the economic depreciation charges, each will require a different discount rate. This will be necessary if the original cost of the plant is to be

⁵ See Appendix for the details of this.

exactly written off over its economic life, and if the project's conventional rate of return on capital employed is to equal the project's DCF yield.

An alternative approach would be to discount all projects at the firm's own cost of capital and to define the 'capital cost' of the project in such manner that the project has a zero present value at this chosen discount rate, assuming that this positive present value is added (or negative present value deducted), in some sense, to the scheme's conventional capital costs (i.e. plant, machinery, etc. costs). This means that the economic depreciation charges will be more (or less) than the project's plant and machinery costs, and to this extent is unsatisfactory since such depreciation charges would not provide a base for estimating the plant's replacement cost when inflation is allowed for. It would also result in the firm's assets always 'earning' the chosen discount rate.

An alternative approach within the context developed in the previous section is to base depreciation upon the concept of long run marginal costs. Long run marginal costs are defined as that sequence of prices through time which just gives addition to capacity the required DCF rate of return⁶, so ensuring a hundred per cent write off of the historic cost. Given the chosen discount rate one advantage of this approach is that in a fully competitive environment the long run marginal cost coincides with the market price, assuming every producer has the same technology, and the same costs. In practice it will at least tend to give the general trend of market prices. Perhaps most importantly the concept gives the optimal pattern of replacement. When a plant's operating costs equal the long run marginal cost price then it should be replaced⁷. At a theoretical level, at least, this approach also overcomes the problem of circularity in price determination⁸. However as far as the problem of adequate retentions is concerned, it is the project's actual cash flows that are crucial, so that from this point of view the use of different discount rates with different projects would appear to be the most appropriate approach.

Implications for Dividend Policy

The use of economic depreciation also leads to a

distribution policy in which the profits available for distribution are a direct reflection of the yield on the underlying investments. It also shows the maximum dividend that can be paid while maintaining the productive potential of the business intact.

If economic depreciation is used then the rate of return after depreciation on the value of written down assets equals the DCF yield on those assets. If the accumulated depreciation charges can also be invested at the same DCF rate, either inside or outside the firm, then the overall return on the shareholder's initial investment is also the same as project's DCF rate of return, (since the written down value of the assets plus accumulated depreciation equals the initial cost of the asset)⁹; so if the return is 15% DCF shareholders can be paid 15% a year while maintaining capacity intact. But if the depreciation charges associated with a particular project can only be invested at a rate lower than the project's DCF yield then the return shareholders can get while maintaining the business intact will be less than the project's DCF rate of return.

This highlights the dangers of possible over-distribution when arbitrary methods of depreciation are employed. Thus, if a method of depreciation is used that initially underestimates the depreciation charge, dividends might initially be higher than 15% on the initial investment, and then might have to decline at least in association with a particular project or major expansion. This might suggest to investors a declining profitability trend and therefore make it more difficult than need be for the company to raise fresh funds. Indeed, it is possible that a company could initially pay out a level of dividends that made it impossible for the company to keep its capital intact – a point which is of considerable interest as it carries the implication that traditional 'prudent' accounting practices, which eschew subjective 'economic' asset valuations, may have to take these later into consideration on occasions to ensure that a reasonably cautious distribution policy is being respected. Thus Table 2 shows that from year 12 the project's gross cash flow will not even cover the straight line depreciation charge let alone provide a dividend. Similarly, if a project's profitability is expected to be significantly lower than originally forecast owing, for example, to running costs being materially higher than planned or unexpected obsolescence then logically a special write off should be made to reduce the written down value of the asset to its economic value.

⁶ For a detailed discussion of the concept see 'Obsolescence and Optimum Replacement Timing' by H. R. Fisher in *The Chemical Engineer*, April 1963.

⁷ See H. R. Fisher op. cit.

⁸ It should be emphasised that this would be the minimum economic price for the product. To the extent that prices are a reflection of costs, this approach will give more consistent results than other systems of 'cost based' prices. The market may, of course, allow for higher prices to be charged, and long run marginal costs should only be regarded as an initial guide to prices for proposed projects.

⁹ This assumes a perfectly competitive finance market where funds can be borrowed and lent at this given interest rate.

The Impact of Inflation and Technical Progress

So far pricing and distribution policy have only been discussed in real terms. If there is technical progress making the cost of newer generations of plant less than it was for older plant in real terms, then distributable profits can be larger than otherwise. Conversely, if technical progress makes production techniques more capital intensive. While if there is inflation and no technical progress distributable profits will be lower if the productive capacity of the business is to be maintained intact.

The approach developed so far is adequate if there is no inflation and the required rate of return is 15%. But if after a number of years inflation suddenly starts, complications arise. If everything inflates at the same rate then there is no problem in calculating the required price adjustments since everything including price simply has to be put up by the general rate of inflation. However, when plant costs and/or operating costs move differently from the general rate of inflation this is no longer so. It might be thought that the appropriate calculation is the one shown below.

Find p such that:-

$$\frac{p - (1 + i_1)c - d(1 + i_2)}{K} = 0.15(1 + i_3)$$

where p is the product price, c is the operating cost before inflation, d is the annual depreciation charge, and K is the historic written down capital stock¹⁰; i_1 , i_2 and i_3 are the inflation rates for operating costs, plant costs and general inflation. However, if in the figures in Table 1 an arbitrary operating cost is used in order to obtain a price from the cash flows it can be checked that the answer to the above equation for the price will be different for each year in which the calculation is done if the rates of inflation are not equal. Given this situation it is probably best to re-price on the basis of

new plant costs (i.e. equivalent to the above calculations in year 1), because the price based on these costs would be compatible with the prices that would obtain in a fully competitive environment. As well as the pricing problem, there will be a backlog of accumulated depreciation charges to make up. Thus, if a sudden decline in dividends or even dissipation are to be avoided future inflation, or changes in its rate, must be estimated or if this cannot be done a safety margin must somehow be built into the provisions for asset replacement.

Now consider the case where the real return required was 15% and that the rate of inflation was correctly forecast to run at 5% a year. The money rate of return would be 20.75% (i.e. 1.05×1.15). However, the shareholder could not expect to get a 20.75% money dividend on his initial investment and also to find the capital of his firm kept intact in real terms. His initial dividend will have to amount to 15.75% on his initial investment (i.e. 0.15×1.05) and this will increase by 5% per annum assuming prices rise annually reflecting the general rate of inflation¹¹. In these circumstances the minimum amount needed to keep the business intact is calculated as follows:-

In each year the historic depreciation charge is multiplied by $(1.05)^t$ where the asset is t years old and inflation is at 5% a year. This must be 'topped up' by adding 5% compound on the accumulated depreciation charges. The method is illustrated by a plant costing £100 and written off over 4 years in equal instalments; 5% a year inflation is assumed. The initial cost is £100 and, therefore, after 4 years its replacement cost will be £121.55 (i.e. $£100 \times (1.05)^4$). The depreciation charges are given in Table 4.

The 113.15 can be regarded as arriving directly from the project's cash flows after allowing for inflation, while the 8.4 of the total should be regarded as coming

¹⁰ The capital stock is updated with a year's lag, since it is the opening capital stock.

¹¹ The arithmetic, but not the basic argument, will differ to the extent that the asset's rate of inflation and the general rate of inflation differ.

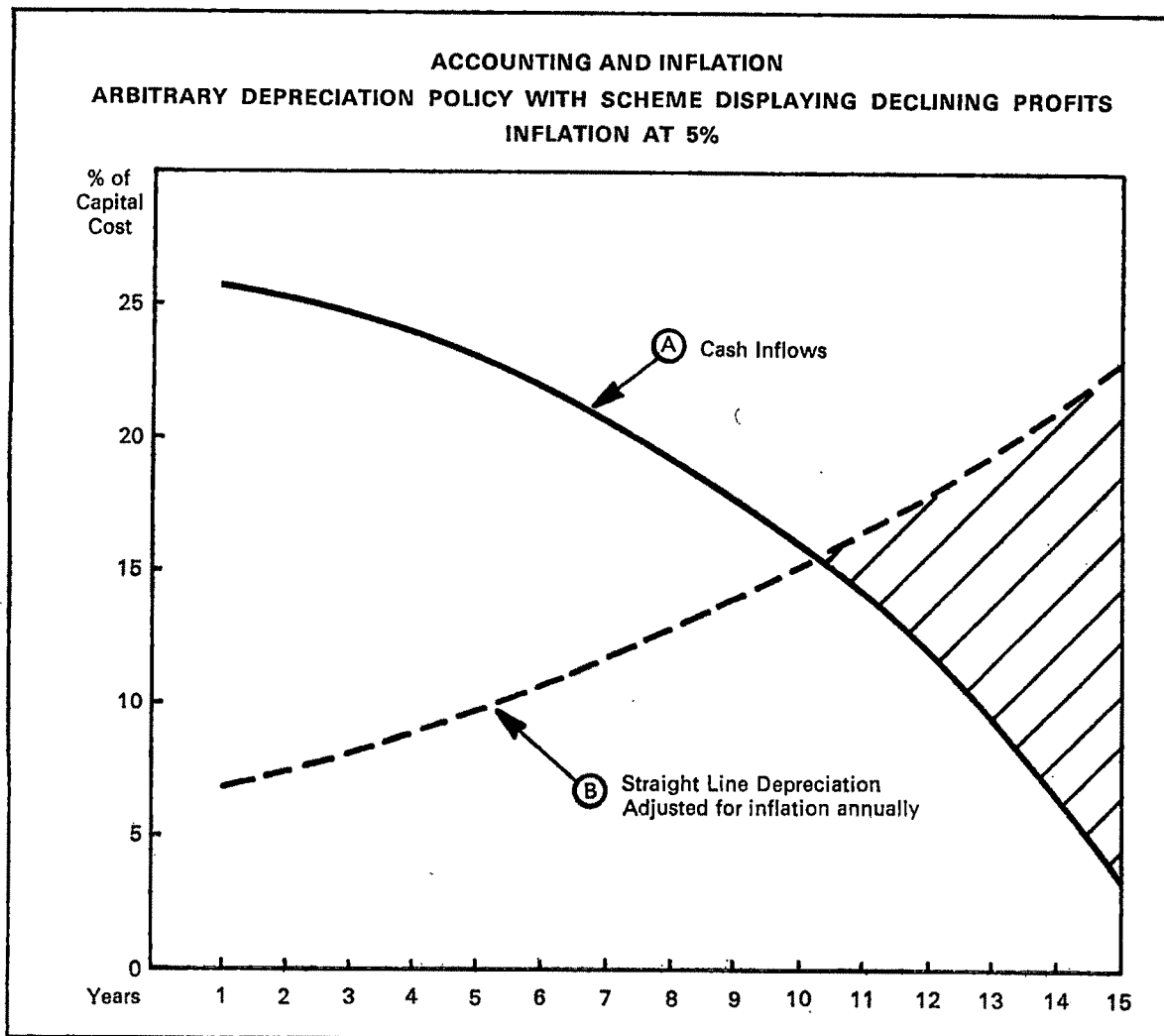
| Table 4 | | |
|---------------|---|--|
| Year | Historic Cost Depreciation Adjusted for Inflation | Plus Inflationary Element in Accumulated Depreciation and Interest Thereon |
| 1 | $25(1.05) = 26.26$ | |
| 2 | $25(1.05)^2 = 27.56$ | $1.30 = (26.26 \times 0.05)$ |
| 3 | $25(1.05)^3 = 28.94$ | $2.76 = (26.26 + 27.56 + 1.30) \times 0.05$ |
| 4 | $25(1.04)^4 = 30.39$ | $4.34 = (26.26 + 27.56 + 28.94 + 1.30 + 2.76) \times 0.05$ |
| Sub Totals | 113.15 | 8.40 |
| Total: 121.55 | | |

from the re-investment of earlier depreciation charges¹². This is because the project's cash flows will not be sufficient to provide the extra retentions in all years. This point also illustrates the possible dangers of using conventional methods of depreciation and then adjusting them for inflation, as the cash generated in the later years of a project's life may be insufficient to cover historic depreciation let alone the additional topping up for inflation necessary to maintain the business intact. This is illustrated in Diagram 1 which shows the cash flows assumed in Table 2, but cumulatively increased by 5% a year, and the straight line depreciation charges adjusted for 5% inflation by the above method.

¹² If the depreciation charges cannot be invested in the firm at a reasonable return, let alone at the asset's rate of inflation, then it would be just as well to let the business decline.

The initial money dividend to the shareholder is 15.75% but his total money return is 20.75% because of the 5% a year appreciation in the capital stock of the firm. This capital appreciation would be reflected in share prices if the market were perfectly informed and responded in a logical manner. However, this may not happen because, apart from imperfections in the market, the 'automatic' retention of extra funds by a company which allows for inflation imposes upon it a more onerous task of seeking opportunities for profitable investment. For a company whose previous growth has taken it to a 'plateau' so far as its own industry is concerned, this element of inflexibility raises serious problems. Should the industry as a whole start to contract and the company cannot (or will not) diversify, retaining extra amounts to allow for inflation may be a most unprofitable policy. Further, the successful use of the DCF criteria re-

DIAGRAM 1



quires all funds arising from depreciation to be immediately re-invested at the selected discount rate, and yet the incidence of depreciation will often cause funds to be available at times which may be relatively unattractive from the point of view of the firm's investment opportunities.

Real and Monetary Rates of Return

(a) *Non depreciating assets*

A basic aim of accounting for inflation is to obtain an estimate of the real rate of return on capital employed. However, the rate of return that shareholders obtain (in the form of dividends and capital gains) is a monetary rate of return; it includes a general inflationary element; similarly for interest bearing securities. Thus, if the 'real' rate of return on capital employed of a company that makes retentions to cover inflation is compared with the return shareholders and other investors obtain very misleading conclusions will be drawn as the element of the increase in the company's capital value will be overlooked. Moreover in order to obtain a valid estimate of the money return on a company's assets this element of capital gain must be explicitly included in calculating the return. For this calculation to have any meaning it is obvious that the asset's specific rate of inflation must be used.

(b) *Depreciating assets*

Unfortunately obtaining real rates of return on depreciating assets is fairly complex and apparently contradictory. This contradiction is illustrated by means of an example in an ideal world where economic depreciation is used and the rate of inflation is uniform over time.

Table 5 shows an asset with a three year life and a 10% real return; the cash flows are divided into interest and depreciation. As can be noted the cash flows shown are consistent with the economic de-

preciation charges being straight line. Table 5a shows the position with a general rate of inflation of 10% superimposed upon the above cash flows, and how the real returns are then calculated.

Table 5. Net Capital Stock and Cash Flows in Real Terms

| Years | 0 | 1 | 2 | 3 |
|------------------------|----|------|------|------|
| Net Capital Stock | 99 | 66 | 33 | 0 |
| Depreciation | | 33 | 33 | 33 |
| Interest at 10% on NCS | | 9.9 | 6.6 | 3.3 |
| Cash Flows | | 42.9 | 39.6 | 36.3 |

The net capital stock adjusted for inflation is obtained by simply multiplying the real net value from Table 5 by the accumulated rate of inflation (i.e. $39.9300 = 33 \times (1.1)^2$); similarly for the depreciation 'charges', and monetary cash flows. The capital appreciation is calculated as 10% of the opening net monetary capital stock.

As can be noted line 8 gives the correct monetary returns of 21% (i.e. $(1.1 \times 1.1 - 1) \times 100$). However line 7 does not quite give the correct real return of 10%, but 11% (i.e. $0.1 \times 1.1 \times 100$). Moreover it is most important to note that the sum of the inflation adjusted depreciation charges does not equal the replacement cost of the asset 131.769 (i.e. $99 \times (1.1)^3$), but 120.153. This 120.153 is equivalent to the first column of Table 4. Overall however these results seem satisfactory since the additional charges needed to obtain the full replacement cost can easily be made. These results however only hold if the historic depreciation charges are calculated on the basis of real terms economic charges; the importance of this statement will be shown below.

Table 5b is exactly analogous to Table 5 except that the project is in money terms with economic depre-

Table 5a. Real Rates of Returns from Monetary Cash Flows

| Year | 0 | 1 | 2 | 3 |
|---|---------|-----------|-----------|-----------|
| (1) Net Capital Stock 'Adjusted' for Inflation | 99.0000 | 72.6000 | 39.9300 | 0.0000 |
| (2) Monetary Cash Flow | | 47.1900 | 47.9160 | 48.3153 |
| (3) Depreciation Charges 'Adjusted' for Inflation | | (36.3000) | (39.9300) | (43.9230) |
| (4) 'Real' Profits | | 10.8900 | 7.9860 | 4.3923 |
| (5) Capital Appreciation | | 9.9000 | 7.2600 | 3.9930 |
| (6) Monetary Profits | | 20.7900 | 15.2460 | 8.3853 |
| (7) Real Rate of Return (4) ÷ (1) × 100 | | 11% | 11% | 11% |
| (8) Monetary Rate of Return (6) ÷ (1) × 100 | | 21% | 21% | 21% |



Table 5b. Net Capital Stock and Cash Flows in Money Terms

| Years | 0 | 1 | 2 | 3 |
|------------------------|---------|---------|---------|---------|
| Net Capital Stock | 99-0000 | 72-6000 | 39-9300 | 0-0000 |
| Depreciation | | 26-4000 | 32-6700 | 39-9300 |
| Interest at 21% on NCS | | 20-7900 | 15-2460 | 8-3853 |
| Cash Flows | | 47-1900 | 47-9160 | 48-3153 |

It is to be noted that exactly 100% of the historic cost is still written off; this of course follows from using economic depreciation.

ciation calculated by using a 21% discount rate¹³. The relation between the figures in Tables 5a and 5b is obvious.

If the only object of the exercise is to obtain the real return on capital employed then all that need be done is the simple sum:-

$$10\% = ([1.21 \div 1.1] - 1) \times 100$$

so that the calculation of a set of inflation adjusted depreciation charges would not be worthwhile. What sums are required for replacing the asset could be calculated by whatever seemed most appropriate to the firm's circumstances and objectives. Moreover on applying the analysis shown in Table 5a it can be checked that the real returns obtained are both incorrect and different in each year.

Since it has been shown that conventional methods of depreciation are quite arbitrary they are, on a priori grounds, just as likely to be equally inconsistent with an environment of no inflation or of inflation at least if the latter is moderate. This being so there is no obvious point in applying arbitrary methods to adjust 'money' returns to real returns or adjusting assets to obtain their 'money worth'. This is even more so when it is realised that the method is completely arbitrary in relation to the objective of keeping productive capacity intact¹⁴ - an objective that in itself is not of universal applicability; retentions being governed by the desire to expand, or the need to contract.

Conclusions

To sum up at a conceptual level, the approaches of accountants and economists can be made consistent through the medium of economic depreciation. At the same time the concept of economic depreciation shows how arbitrary conventional accounting procedures can be in relation to the underlying economics of business

situations. Unfortunately there is considerable danger that such arbitrary approaches will be further extended. While this paper has by no means solved the problems it has attempted to bring to light, it nevertheless indicates that much more research needs to be done in this area. There must be considerable doubts as to whether or not the proposed methods of attempting to estimate real rates of returns and hence actual value of assets has any great utility.¹⁵ By attempting to impose further restrictions on the maximum level of distributable profits via inflation adjustments to depreciation arbitrary constraints will be placed upon company action. In a world where it can be assumed that businessmen are capable of making rational decisions the imposition of further restraints on their actions or policies can only result in suboptimal behaviour. Therefore such constraints could only be justified if it is assumed that in general businessmen are either irrational or irresponsible, or both. None of the arguments here should be taken as indicating a blasé view of inflationary problems, clearly they are serious. Rather the point of view argued here is that individual firms and businesses know (or should know) their own problems best. They should therefore as far as is practical solve their problems as seems best in their particular circumstances. Arbitrary procedures will work against flexibility and in favour of rigidity.

Appendix

An economic approach to depreciation

A company's balance sheet is meant to give a 'true and fair view' of a company's assets and liabilities at the end of the accounting period, although it is not professed to be a 'valuation' as such. But, at least as far as the internal management of the organisation is concerned, it may be considered desirable for the value

¹³ It is to be noted that exactly 100% of the historic cost is still written off; this of course follows from using economic depreciation.

¹⁴ Assuming even then that the extra retentions needed are made, i.e. column 2 of Table 4.

¹⁵ The obvious exceptions are non-depreciating assets such as shares. Here, however, the revaluation would have to be based on set specific inflation rates if it was to have any meaning at all.

of fixed assets to be taken as equivalent to their net worth; that is their expected future discounted earnings. This assumption is used as a basis for deriving a theory of depreciation. The assumption that a company's assets should reflect their net value is not itself novel but the implications of this approach have not, so far as we know, been pointed out¹⁶.

The important aspects of this approach to depreciation are (a) that it can give an economically valid estimate of the worth of assets, (b) if perfect foresight is assumed then in any year the profits less depreciation, divided by the written down value of the asset at the beginning of the year *always* equals the DCF rate of return. This result, which was illustrated in the text, is now proved for all possible cases of profit streams.

Proof:

Define the initial value of the asset as its future discounted earnings stream, formally:-

$$\sum_{t=1}^T \frac{c(t)}{(1+r)^t} = K(0)$$

where $K(0)$ = initial worth of the asset¹⁷, $c(t)$ = cash flow (positive or negative) of project in year t , r = DCF rate of return. More generally define:-

$$\sum_{t=n}^T \frac{c(t)(1+r)^{(n-1)}}{(1+r)^t} = K(n-1)$$

where $K(n-1)$ is the net worth of the asset (project) at beginning of the n th year of the project.

We now wish to prove that:-

$$\frac{c(n) - d(n)}{K(n-1)} = r$$

where $d(n)$ = depreciation charge in year n of the project, and which is defined as $K(n-1) - K(n)$.

The proof is as follows:-

$$\begin{aligned} \frac{c(n) - d(n)}{K(n-1)} &= \frac{c(n) - [K(n-1) - K(n)]}{K(n-1)} \\ &= \left[c(n) - \sum_{t=n}^T \frac{c(t)(1+r)^{n-1}}{(1+r)^t} + \sum_{t=n+1}^T \frac{c(t)(1+r)^n}{(1+r)^t} \right] \div K(n-1) \end{aligned}$$

¹⁶ Since drafting this paper we have come across a number of references which indicate that these results have been derived before. Nevertheless they do seem little known.

¹⁷ Taken from year 0 of the project, discounting on an annual basis starting from year 1.

$$\begin{aligned} &= \left[\frac{c(n)}{(1+r)^{n-1}} - \sum_{t=n}^T \frac{c(t)}{(1+r)^t} + \sum_{t=n+1}^T \frac{c(t)(1+r)}{(1+r)^t} \right] \div \frac{K(n-1)}{(1+r)^{n-1}} \\ &= \left[\frac{c(n)}{(1+r)^{n-1}} - \frac{c(n)}{(1+r)^n} + \sum_{t=n+1}^T \frac{c(t)r}{(1+r)^t} \right] \div \frac{K(n-1)}{(1+r)^{n-1}} \\ &= \left[(1+r)c(n) - c(n) + \sum_{t=n+1}^T \frac{c(t)(1+r)^n r}{(1+r)^t} \right] \div (1+r) K(n-1) \\ &= \left[r c(n) + \sum_{t=n+1}^T \frac{c(t)r(1+r)^n}{(1+r)^t} \right] \div (1+r) K(n-1) \\ &= \left[\sum_{t=n}^T \frac{c(t)r}{(1+r)^t} \right] \div (1+r) \frac{K(n-1)}{(1+r)^n} \\ &= \left[\sum_{t=n}^T \frac{c(t)(1+r)^{n-1} r}{(1+r)^t} \right] \div K(n-1) \\ &= k(n-1)r \div k(n-1) = r \end{aligned}$$

Discussion of Result

The cash flows as defined could be positive operating profits from the project, negative outflows of plant expenditure, or negative operating profits due to failure to fully recover fixed costs during the commissioning period. Thus, for example, if the project initially has a few years of negative cash flows (or small positive cash flows) the present value of the project will increase for a few years, so that the depreciation charges will be negative. In schemes with very long gestation periods these negative charges could, in effect, double the capital costs of the scheme, and so lead to a doubling of the positive depreciation charges. Failure to allow for this in 'full cost' pricing based on conventional depreciation charges could lead to too low prices. While the failure to capitalise the negative cash flows and then write off by the economic method of depreciation will not enable enough funds

to be retained to maintain dividends when the project's plant is being replaced, since the replacement will be subject to a similar gestation period.

The problem of different solution rates for different projects was briefly discussed earlier. The mathematics of this section can be made consistent with all three approaches to this problem. The discount rate r can be defined as the project's internal rate of return¹⁸ and automatically be consistent with writing

off the original capital expenditure (which could be further capitalised if appropriate). Alternatively, the worth of the project's plant could simply be defined as its present value at the chosen discount rate. Finally, the cash flows could be those derived from the project's long run marginal cost.

Acknowledgement

The author wishes to thank his colleague Mr. S. Wiseman for help in the preparation of an earlier draft of this paper.

¹⁸ Though this avoids the problem of multiple IRR's for an individual project.

Business Combination and the Creation of Goodwill

Benzion Barlev

A recent opinion by the Accounting Principles Board (APB) of the American Institute of Certified Accountants [1]* called attention to the old (and as yet) unresolved problem of goodwill. The Board emphasized the unique characteristics of intangible assets, including goodwill, namely: their lack of physical qualities, the difficulty of estimating their values and the fact that their useful lives may be indeterminable. As a result the Board could only suggest an arbitrary solution to the accounting problem of goodwill. This solution which is hard to defend on a theoretical basis arouses considerable objections and dissatisfaction amongst the financial community [2]. The opinion thus reaffirmed that an understanding of the very nature of goodwill is essential before a sound solution to the accounting problems involved can be reached.

The objective of this paper is to explore the reasons for the payment of a premium for intangible assets and to suggest some additional dimensions of the concept of goodwill. The analysis offers some guidelines for a solution to this problem and will make use of recent developments in economic and financial theory. In the first section some historical developments in the treatment of goodwill are discussed. In the second, the economic theory of business combinations is reviewed; sources of gain from mergers and acquisitions are analyzed and conclusions with respect to goodwill are derived.

Historical concepts and valuation of goodwill

In a recent study, Cattlet and Olson reviewed the history of the concepts of goodwill. They cited a wide range of concepts: the traditional one which identifies goodwill with the patronage of customers,

other concepts which include the loyalty of employees and the credit standing of the firm, and the most widely accepted concept which associates goodwill with above normal return on investment [3]. The latter, no doubt, is too general a concept. It should be realized that above normal return is only an indication that a firm has some economic advantages over other firms in the same industry [4], but the main problem still remains: what are the causes for the above normal return? Cattlet and Olson, for example, offered a long list of reasons, recognizing, however, that it is impossible to supply a conclusive list of factors and conditions that contribute to the formation of the above normal earning power [5].

For accountants, once the nature of goodwill is assumed to be known, the accounting problem is narrowed to the determination of its value, its length of useful life and its method of amortization. It is possible to distinguish two main steps in the search for the value of goodwill. The first is the determination of the value of goodwill as the 'excess of the cost of shares in a subsidiary over the book amount of the net assets of this subsidiary at the date of acquisition' [6]. This 'excess', however, does not represent the real value of goodwill since, assets are carried in the balance sheet on the basis of their 'historical cost' which is often less than their real value. In addition to the above deficiency, according to generally accepted accounting principles, various intangible assets do not appear in the balance sheet, yet their existence is undenied (e.g., expenses for research and development that produce valuable assets). The second step thus allows for revaluation of tangible assets and for recognition and valuation of intangible assets before the determination of the value of goodwill.

Estimation of the useful life and the determination of the amortization method of goodwill remain among the critical accounting problems which because of their tangible nature have not been systematically

* Figures in square brackets in this article refer to authorities cited on p. 308.

solved. The predecessor of the APB, the Committee on Accounting Procedures suggested the following treatment of goodwill. Two cases were recognized: (i) where goodwill has a limited term of existence and (ii) where it does not have a defined term of existence. In the first case goodwill should be amortized systematically over the period benefited. In the second, it should be retained on the balance sheet at its historical cost [7]. The APB's new resolution that superceded the above rule stipulates that no matter what the evidence for the term of existence of goodwill, it should be amortized, and the period of amortization should not exceed forty years. While the earlier recommendation recognizes that goodwill should be treated according to its nature, it supplies neither a theory nor definite guidelines for deciding how to deal with goodwill. The latter recommendation, while possibly a practical one, is absolutely arbitrary. No efforts were made to develop a theory or to study the behaviour of goodwill in support of this solution.¹

Most of the conventional accounting concepts of goodwill have a common basic assumption that the amount paid in excess of the market value of a firm's net assets represents a payment for an intangible asset which is inherent in the acquired firm². In order to identify the intangible asset of goodwill, accountants have directed their efforts to a study of the acquired firm. But they have ignored the well known phenomena: (1) that different firms place different values on a company under consideration for acquisition, and (2) that economic benefits of various magnitudes can be achieved through business combination.

Recent works in economics and finance investigated the sources of the economic benefits generated by the process of business integration. On the basis of these studies, it is claimed here that goodwill is an asset *created* by the integration, and that its magnitude is a function of the characteristics of *all* the constituents of the merger.

Economic theory of business combination

Usually we divide business combinations into three broad categories:

- (1) Horizontal integration – where the participating firms are in the same stage of production;

e.g., merger of several manufacturers of steel, several commercial banks, etc., [9].

- (2) Vertical integration – where the firms involved are 'concerned with different though directly related stages of production' [10]; e.g., integration of producer of polyethylene resins with the producer of polyethylene film, etc.
- (3) Conglomerate merger – where the integration takes place between 'firms whose products may be only remotely, if at all, related' [11].

Business combinations originate for some specific reason(s). The two main sources of economic gain in the case of horizontal integration are apparent. One stems from the creation of a degree of monopolistic power – a direct result of the reduction in the number of firms within the same stage of production. The second is the economies of production on a large scale. These are to be found, for example, in the process of manufacturing, distribution, advertising, research and management [12].

The sources of economic gain, in the case of vertical integration, are less clear. The two mentioned earlier – market power and reduction of costs through economies of scale – are often cited as relevant to vertical integration as well, although not without some reservations [13]. It is, however, possible to distinguish between the sources of cost savings that are associated with economies of scale in horizontal and vertical integration. In vertical integration cost reduction occurs mainly because of the following reasons:

- (1) New or extended technologies, that may not otherwise fit, are utilized, e.g., integrated production lines and plant layouts.
- (2) Transaction costs between firms are saved; these include the cost of
 - (a) searching for price,
 - (b) closing contracts, and
 - (c) collecting payments.
- (3) Coordination and combination of activities between the constituents to the merger is possible. Examples of this are economies on inventory and on working capital [14].

The case of the conglomerate merger is more complicated than that of either horizontal or vertical integration. Because of the remote economic relations between the parties to the merger, the traditional analysis of mergers that focuses on the creation of monopolistic power and on economies of scale is irrelevant. Two of the suggested sources of economic gain are:

- (1) reduction in the cost of borrowing, and

¹It is interesting to note that in Great Britain the professional accounting bodies only dealt with the problems of goodwill incidentally. For an example, see [6].

²APB's *Opinion No. 17*, for example, reads as follows: "... a company should record as assets the cost of intangible assets acquired from others, including goodwill acquired in a business combination" [8].

(2) reduction in the lenders' risk³ [16].

The cost of borrowing declines, up to a certain point, with the size of the firm. Large firms which acquire smaller firms can refinance the debt of the latter at a lower borrowing cost and can thus achieve a substantial gain. On the other hand conglomerate mergers result in diversification that reduces the variability of earnings of the combined entity. Thus, a conglomerate merger reduces lenders' risk, and creates a true economic gain.

Business combination and goodwill

The main sources of economic gain in business mergers and acquisitions may be summarised as follows:

| Possible Sources of Economic Gain in Business Combination as Related to Type of Combination | | | |
|---|---------------------|----------|--------------|
| Source of gain | Type of Combination | | |
| | Horizontal | Vertical | Conglomerate |
| (1) Monopolistic power | Yes | Yes | |
| (2) Economies of Scale | | | |
| (a) Production | Yes | | |
| (b) Advertising | Yes | | |
| (c) Distribution | Yes | | |
| (d) Research | Yes | | |
| (e) Management | Yes | Yes | Yes (7) |
| (3) Cost Saving | | | |
| (a) Employing Technology | | Yes | |
| (b) Transaction costs | | Yes | |
| (c) Coordinating activities | | Yes | |
| (4) Cost of Financing | | | |
| (a) Reduction of Cost of Borrowing | Yes | Yes | Yes |
| (b) Reduction of Lenders' Risk | Yes | Yes | Yes |

These sources of economic gain present a sound justification for business mergers and acquisitions. Moreover, they explain why an acquiring firm is willing to pay a premium over the market value of the acquired firm. The fact that, very often, the value of the combined entity rises to surpass that of its constituents demonstrates the economic value of these sources⁴.

³Other reasons are, for example, tax benefit that result either from (a) a loss carry over, or from (b) investment credits which cannot be used by an independent firm with insufficient taxable income. Here we do have incentive for integration although no gain would be possible in a perfect market [15].

⁴This phenomenon was observed and named 'synergism' in the financial literature. Synergy, which has also been referred to as the '2 + 2 = 5 effect', was defined as 'The situation in which the sum of two or more parts is greater than their individual contribution' [17].

The amount paid for these sources of economic gain cannot be identified with any specific asset of the acquired firm, since the gain depends on the asset combination of the acquiring firm as well. Thus, it is usually capitalized as 'goodwill' in the consolidated balance sheet of the new entity. It is interesting to note that since there are imperfections in the 'market of combinations' the sum given to the stockholders of the acquired firm, for the possibility to generate a new source of gain, is negotiable. The upper limit of this remuneration is determined by the expected gain from the combination or, with the exception of the case of generating monopolistic power, by the cost of establishing a new firm equivalent to the one acquired. The item of 'goodwill' as a result, may appear on the balance sheet of the acquired firm at a lower value than the present value of the expected benefits to be derived from the merger. Naturally, there is a strong relationship between this premium (goodwill) and the increase in the value of the combined entity, above that of its constituents (the 'synergism'). The higher the premium – the smaller the 'synergism' but the more fully the premium paid represents the value of the economic gain achieved as a result of the combination.

Goodwill that arises in the process of business combinations is, therefore, the product of two main components:

- (1) the premium paid in excess of the market value of the acquired firm, and
- (2) the difference between the market value of the acquired firm and the fair value of its assets – a difference that may be traced to economic resources achieved through earlier business combinations or through self-growth.

Once the reasons for paying premium in excess of the market value of the acquired firm are known, accountants should not report this amount as an unidentified asset under the title of 'goodwill'. Instead, they should identify and measure its components and detail the specific reasons for the payment of this premium in each case of business combination [18]. This is by no means a simple task. At the current stage of financial reporting, we would have to make a thorough investigation into the calculations and the process of evaluation that were used by the acquiring firm. Assuming that such calculations are made the goodwill should be treated as follows:

- (1) It should be reported on the balance sheet under a more descriptive title, such as:
 Payment for expected gains due to economies of scale
 Payment for expected gains due to savings on

inventories

Payment for expected gains due to low cost of borrowing.

- (2) It should be related to the period of time over which it is expected to contribute economic gain. For example, monopolistic power decreases in value at a rapid rate as new firms enter the industry [19]. Thus, the value of this asset should be amortized accordingly. On the other hand, potential gains due to economies of scale and cost savings (on working capital or on inventories) are of a permanent value to the acquiring firm as an integral part of its size. Such assets should not be amortized but should be retained at cost.

Example

The hypothetical financial statements of Company S, whose shares are traded on the stock exchange, are as follows:

| COMPANY S | | | |
|---------------------------------------|--------------------|--------------------------------|--------------------|
| Balance Sheet as at December 31, 197x | | | |
| Assets | \$1,000,000 | Capital | |
| | | Ordinary shares of \$1.00 each | \$600,000 |
| | | Long term liabilities | 400,000 |
| | <u>\$1,000,000</u> | | <u>\$1,000,000</u> |

| COMPANY S | | | |
|--|-----------|--------------|------------------|
| Profit and Loss Account for the year ended December 31, 197x | | | |
| Sales | | \$10,000,000 | |
| Cost of Goods Sold | | 9,000,000 | |
| Gross Income | | | 1,000,000 |
| Selling and Administrative Expenses | \$520,000 | | |
| Interest on Debt | 80,000 | | |
| | | | <u>600,000</u> |
| Income before taxes | | | 400,000 |
| Taxes | | | 200,000 |
| Net income for the year | | | <u>\$200,000</u> |
| Earnings per share | | | \$3.33 |

The price of a share of Company S is \$3.00; thus, its market value is (600,000 shares times \$3.00) \$1,800,000 compared to \$600,000 book value. For business combination purposes the assets of Company S are revalued. The results are as shown in the next table.

Note the appearance of Goodwill, which represents here the difference between the market value of Company S and the fair value of its identifiable assets.

Assume now that Company P offers \$3.45 for a share of Company S, and that it buys all the outstanding shares. Thus Company P pays \$2,070,000

| COMPANY S | | | |
|--|--------------------|--------------------------------|--------------------|
| Revalued Balance Sheet as at December 31, 197x | | | |
| Assets | \$1,000,000 | Capital | |
| Addition due to revaluation | 500,000 | Ordinary shares of \$1.00 each | \$600,000 |
| | | Surplus due to revaluation | 1,200,000 |
| Patents | 300,000 | Long term liabilities | 400,000 |
| Trade Marks | 150,000 | | |
| Goodwill | 250,000 | | |
| | <u>700,000</u> | | |
| | <u>\$2,200,000</u> | | <u>\$2,200,000</u> |

(600,000 shares times \$3.45) for Company S, an amount which is \$270,000 higher than Company S's market value. If Company P applies generally accepted accounting principles and methods, it will show a 'goodwill' of \$520,000 on its balance sheet ('goodwill' from revaluation of \$250,000 plus a premium of \$270,000). It is our contention that the premium of \$270,000 is paid for economic gains created in the process of business combination and should be identified more clearly.

Assume that two types of gains are forecast:

- a reduction in the cost of borrowing, and
- economies of scale in production,

with net present value of expected gains of \$300,000 and \$600,000 respectively. The premium of \$270,000 paid to the shareholders of Company S may be divided between the two companies relatively to their expected gains. Thus, we would get two new items on the balance sheet of Company P:

- Payment for expected gains due to lower cost of borrowing \$ 90,000
- Payment for expected gains due to economies of scale \$180,000

Assume now that gains due to economies of scale are estimated to last indefinitely. Gains due to lower costs of borrowing, on the other hand, have an estimated life of ten years, during which equal gains are expected. The first intangible asset should, therefore, be retained at cost unless a reduction in its value becomes evident. The latter should be retained at cost and amortized systematically, as an operating expense, over its estimated useful life.

Further implications and conclusions

A full reporting of the assets generated in the process of business combinations is undoubtedly more valuable to investors than the reporting of the single unidentified item of 'goodwill'. More information explaining the earnings flow of the firm is received, enabling a more sophisticated level of

analysis of the firm's financial position as well as improvement of predictions and conclusions to be drawn from the analysis. Reporting on such items is a complicated matter since no objective documentation is usually available and the communication of this information involves subjective judgment. However, this problem is a key problem in financial accounting (e.g., reporting on current values, net present values, etc.), and is not specific to goodwill alone.

The analysis of goodwill contains an added benefit for management control. Managers at different levels are advised by top management about the potential gain from the combination. On the basis of their evaluation and advice, a decision about the merger is reached. A comparison between the expected gains and the *ex post facto* gains could be an important tool for the evaluation of management performance.

The economic and financial literature indicates possible sources of economic gain from the process of

business mergers and acquisitions. These gains give some indication of the reasons for business integration as well as for the increase in the value of the combined entity. It has been argued in this paper that the economic gain is the main cause for paying a premium over the fair market value of a firm, and that any goodwill created during the process of business combination represents an economic gain and should be dealt with accordingly.

The current difficulties associated with identifying the source of an economic gain and determining its cost, call for further investigations into this problem. It seems, however, that the conceptual understanding of the nature and creation of goodwill will help accountants solve the accounting problems involved.⁵

⁵It is also interesting to note the case of a firm which grows internally and not through business combinations. Such a firm enjoys many of the economic gains discussed. However, because of the traditional 'historical cost' method of evaluation of assets, the balance sheet of such a firm would not reveal the existence of these resources.

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Optimal asset lives

K. N. Bhaskar

This paper is a sequel to some of the earlier articles on optimal asset lives that have appeared in accounting journals.¹ The technique employed to calculate the optimal life of an asset is termed optimal replacement policy (ORP). A number of assumptions made in this field are first spelt out in detail. These assumptions may limit the applicability of ORP for the practising accountant.

Assumptions made

There are many assumptions made by optimal replacement policy in order to simplify the analysis and the accountant should at least be aware of the rather severe assumptions employed in optimal replacement policy (ORP).

It is important to have some knowledge and to understand the assumptions inherently made in using ORP techniques in real world situations. This is because it may very well be that what was thought to be an appropriate case for ORP is inappropriate because the assumptions do not accord with the facts. This is, of course, not to say that the facts must be an exact replica of the assumptions, but at least they should be an approximation.

The most fundamental assumption in ORP is that each asset will be replaced by an asset which is in financial terms identical to the one it replaced – i.e. identical original cost and annual cash flows. Moreover, the asset that replaces the replacement is also assumed to be identical to the first (and original) asset, and hence identical to the replacement. This means that from now until infinity there is a chain of replacements of identical assets. Consider this assumption related to the problem of the optimal life of a car. ORP implicitly assumes that the replacement car has identical financial parameters. If the cost of petrol and the purchase price of cars remain unaltered, then the replacement car will have identical fuel consumption,

repair costs and so forth. This assumption indicates that as soon as anything affects these factors, ORP is inappropriate. Since the motor trade is constantly incorporating new technical features into successive models, it may be argued that the indefinite chain of replacement argument is invalidated. Others would argue, however, that the actual financial parameters (in real terms) have changed very little over the years (despite model changes), and that therefore the indefinite chain of replacement assumption is approximated by the real world.

Another assumption is that the utilisation of the replacement asset (and the replacement of the replacement asset, etc.) is exactly the same as the original asset. This assumption is not an explicit one, for all that is required is that the financial parameters are the same from asset to asset. This may involve one particular cost offsetting another. For example, utilisation of the replacement machine may be lower, therefore maintenance costs may be lower. On the other hand, perhaps an increase in labour costs with this machine may have offset the lower maintenance costs. The current and the replacement machine may therefore have identical financial parameters. The problem with this is that given no other changes, one assumes that the labour costs will be higher indefinitely, and that the rate of utilisation will be lower for ever. It seems more sensible, therefore, to state this assumption explicitly, otherwise great care must be taken in offsetting one cost by another and so forth. This assumption may of course be ignored if no changes in costs or revenues are incurred through a change in the utilisation of the asset.

This paper assumes that the world is a certain one. This is hardly a realistic assumption. In fact, ORP does not require such an unrealistic assumption. All that is required with ORP is that the replacement asset must have the same degree of risk attached to it as the current asset. For example, cars go wrong and it is very difficult to predict accurately when, say, a car's gearbox will need renewing. What might happen, however, is that one might attach the same degree of

¹For example, see Professor W. T. Baxter 'Asset Lives: Choice of Optimum Length', *Accountancy* 1966, page 537, and Professor George J. Staubus, 'Asset Lives: Three Comments', *Accountancy* 1967, page 658.

confidence in the replacement car's gearbox needing repairing as the original car's gearbox. The actual event of the gearbox developing a fault is still uncertain, but at least both assets (the current and replacement car) have the same chance of this event occurring.

It is assumed that the firm wishes to maximise the cash contribution from an asset. To have stated the firm's objective in terms of minimising cost would have necessitated making some additional assumptions. To be concerned with minimising costs would ignore changes in revenue that might occur from differences in quality between the replacement and current asset. If the revenue associated with an asset is included, then this takes care of differences in the quality of the product of the two assets. If, however, only the costs of an asset are considered two further assumptions are necessary:

- (1) identical quality of the output or service of the replacement and the current asset.
- (2) identical throughput from both assets. (This assumption may be covered by the constant utilisation assumption.)

This paper takes into account both the revenues and costs of assets and therefore these assumptions are not necessary. Throughout this paper, when an asset is said to be better than another asset, what is meant is that it has a higher present value.² Another assumption used in this paper is that all cash flows are assumed to occur at year ends. All cash flows are considered to be in real terms.

Different types of decisions

There are many different problems concerned with optimal asset lives. Four major types of problem can be isolated:

- (1) The optimal life of a new asset.

This is in many ways the most simple type of decision, where just the optimal life of a new asset is calculated, (i.e. it is not already owned by the firm) assuming that this asset will be replaced by another when it has run its optimal life. An example of this type of situation is when a firm is considering buying an asset that it has never used before.

- (2) The optimal asset.

In this type of problem, the firm may either have to choose an optimal asset from a number of alternative assets available or to determine if a second-hand asset of any given age, run for its optimal period (calculated in 1), is a better purchase than a new asset run for its optimal life.

- (3) The optimal life of an existing asset.

Once the optimal asset has been worked out in 2, it may be necessary to calculate the optimal time at which an existing asset should be replaced by the optimal asset (as calculated in 2).

- (4) Pure retirement decision.

If the need for the equipment terminates with its retirement, when is it the best time to retire it?

Relevant variables

Any capital costs concerned with an asset will have to be taken into account. So will any scrap value associated with it.

If we are considering a life of, say, two years, then the scrap value may be quite high because the asset would be bought by someone who would put it to some good use. The cash contribution each year has two elements to it: (a) revenues associated with the asset, excluding the scrap proceeds, and (b) the running costs of an asset. Examples of the latter of these are such items as repair costs, maintenance costs and the cost of fuel. These variables are notated in the following manner in this paper:

F_t = Sales revenue associated with the asset in year t

R_t = Running costs in year t

$P_t = F_t - R_t$ = Cash contribution of the asset in year t

Q_0 = Capital costs of the asset at year 0 (i.e. end of year 0 = start of year 1)

S_t = Scrap value of the asset at year t

$V(n)$ = Value of the asset if the asset runs for a life of length of n years.

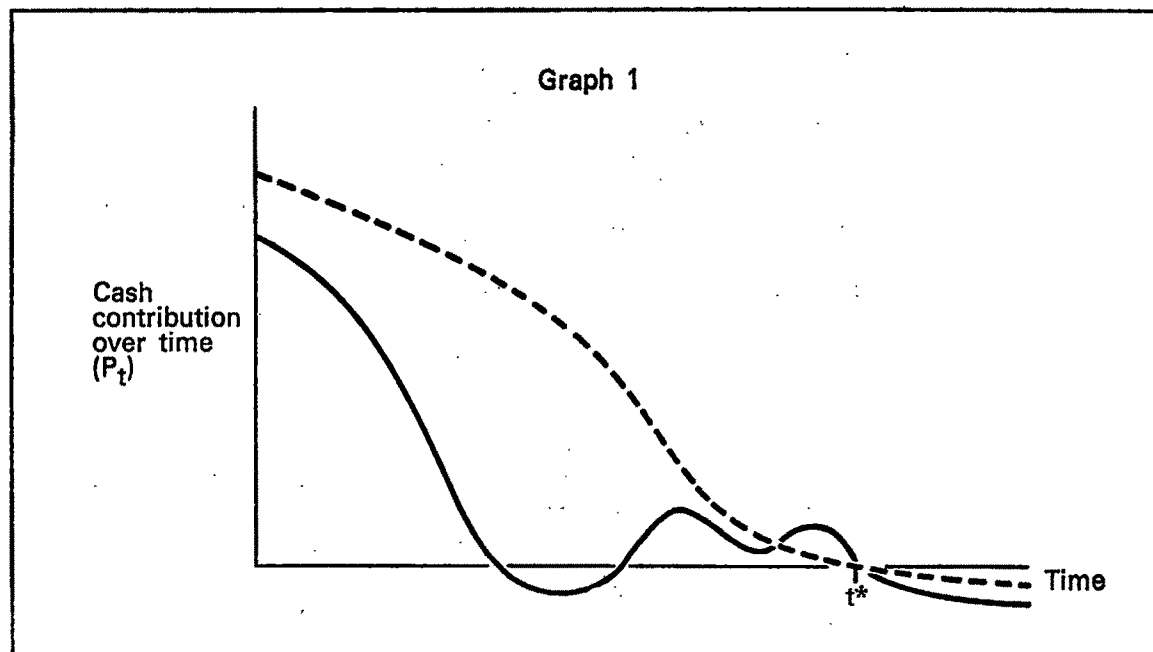
Assuming a zero scrap value, a sufficient condition for there to be an optimum length of an asset's life that is less than infinity is for the cash contribution (P_t) to become negative at some time, say, year t^* , and to stay negative or zero for all years after year t^* . Notice that it is not necessary for all the cash contribution to decline monotonically. In Graph 1, the solid line is an example of an asset which has a non-monotonically decreasing cash contribution. This asset would have a finite optimal life since after t^* the cash contribution is negative each year. The dotted line in Graph 1 is an example of a monotonically decreasing curve.

Relaxing the assumption of a zero scrap value but retaining all the other assumptions, there will be a finite optimal life, provided the scrap value declines monotonically over time.

The optimal life of an asset

In order to simplify the analysis, a zero rate of interest is assumed initially. Supposing an asset is planned to be kept for n years, then the present value of that asset is:

²The present value of an asset is calculated by discounting all the cash flows of the asset (capital costs, running costs, revenues, etc) to the present time.



$$V(n) = \sum_{t=1}^n P_t + S_n - Q_0 \quad (1)$$

This formula states that the present value of an asset kept for n years is equal to the sum of the cash contributions from year zero up to and including year n , together with the scrap proceeds of the asset at year n , less the initial capital costs.

The present value per year (or annual equivalent) should be calculated. This changes equation (1) to:

$$\frac{V(n)}{n} = \frac{1}{n} \left[\sum_{t=1}^n P_t + S_n - Q_0 \right] \quad (2)$$

$$\text{let } Z = \frac{V(n)}{n} \quad (3)$$

The optimal life of an asset will give a value of Z – the present value per year – this is highest of all the possible lives. In order to find the optimal life, one finds the life that maximises Z . In appendix 1 this is done by means of simple calculus. An easier method is to calculate values of Z corresponding with different lives (n) and choose that life (n^*) that has the largest Z . This life (n^*) is then the optimal life.

In order to demonstrate this procedure, an example is given. Supposing an asset has the following functional relationships:

$$P_t = 110 - 10t \text{ for } 1 < t < 11 \text{ otherwise } P_t = 0$$

$$S_t = 23 - 3t \text{ for } 1 < t < 7 \text{ otherwise } S_t = 0$$

$$Q_0 = 100 \quad \text{where } t = \text{time}$$

This asset has an initial outlay of £100, and a diminishing cash contribution from year one onwards.³ (In year one, P_1 , equals £100; in year P_2 equals £90 and similarly with the scrap value.)

In Table 1, the values of t , P_t , $\sum P_t$, S_n , $V(n)$ and Z are shown.

TABLE 1

| n | P_n | $\sum P_t$ | S_n | $V(n)$ | $Z = \frac{V(n)}{n}$ |
|-----|-------|------------|-------|--------|----------------------|
| 1 | 100 | 100 | 20 | 20 | 20.0 |
| 2 | 90 | 190 | 17 | 107 | 53.5 |
| 3 | 80 | 270 | 14 | 184 | 61.33 |
| 4 | 70 | 340 | 11 | 251 | 62.75 |
| 5 | 60 | 400 | 8 | 308 | 61.6 |
| 6 | 50 | 450 | 5 | 355 | 59.17 |
| 7 | 40 | 490 | 2 | 392 | 56.0 |

By inspection it can be seen that the optimal life of this asset is in year number four – that is, at the end of year 4.

Other formulations

Professor W. T. Baxter⁴ uses a slightly different formulation from that used here; this is:

³Note that in this case P_t never becomes negative. However as will be seen later the asset does have a finite optimal life.

⁴Accountancy August 1966, pages 537-544.

$$W = \frac{1}{n} \left[Q_0 + \sum_{t=1}^n (P_t - P_1) - S_n \right] \quad (4)$$

He advocates that W should be minimised with respect to n ; this formula does in fact yield the same optimal life as maximising expression (2). The two formulae differ by a constant⁵ which will not alter the optimal life (n^*). It appears, however, that the formula presented in this paper is easier to understand and to apply.

Analysis with interest

The present value $V(n)$ may be modified to accommodate interest, thus:

$$V(n) = \sum_{t=1}^n \frac{P_t}{(1+r)^t} + \frac{S_n}{(1+r)^n} - Q_0 \quad (5)$$

Previously Z was defined as a simple average of the total present value over n years - viz:

$$Z = \frac{V(n)}{n}$$

To include the effect of interest, Z is redefined as the yearly instalment of the annuity (stretching over a given life span) with the same present value:

$$Z = \frac{V(n)}{\sum_{k=1}^n \frac{1}{(1+r)^k}} = V(n) \left[\frac{r}{1 - (1+r)^{-n}} \right] = \frac{V(n)}{a_{n|r}} \quad (6)$$

⁵Minimising W is equivalent to maximising $-W$.

$$\begin{aligned} -W &= \frac{1}{n} \left[\sum_{t=1}^n (P_t - P_1) + S_n - Q_0 \right] \\ &= \frac{1}{n} \left[\sum_{t=1}^n P_t - nP_1 + S_n - Q_0 \right] \\ &= \frac{1}{n} \left[\sum_{t=1}^n P_t + S_n - Q_0 \right] - \frac{nP_1}{n} \\ &= \frac{1}{n} \left[\sum_{t=1}^n P_t + S_n - Q_0 \right] - P_1 \\ &= Z - P_1 \end{aligned}$$

Written in full Z becomes:

$$Z = \frac{1}{a_{n|r}} \left[\sum_{t=1}^n \frac{P_t}{(1+r)^t} + \frac{S_n}{(1+r)^n} - Q_0 \right] \quad (7)$$

Earlier in the zero interest case, it was stated that everything should be brought down to an annual equivalent basis. With a positive rate of interest there is an alternative method of calculating the optimal life. Instead of finding the maximum annual equivalent for different lives,

$$\left(\frac{V(n)}{a_{n|r}} \right)$$

the largest perpetuity can be found.⁶ This is equivalent to dividing the annual equivalent by the rate of interest.

In Table 2, the example discussed earlier has been reworked to include a 20 per cent rate of interest. The optimal life is now five years, compared with four years with a zero discount rate.

Effect of interest

Items that are further away in the future have smaller weights attached to them, whilst items close to the present have less small weights. Assuming a large initial outlay, higher interest rates have two important effects:

- (1) They increase the optimum life of a given asset and
- (2) They also favour the purchase of less expensive shorter-lived assets, and/or assets with a lower initial capital cost and higher running costs.

For the reader who wishes to follow up these effects, they are aptly demonstrated in Professor Baxter's article.

Optimal replacement

The situation might arise when there are a number of new assets available that would be suitable either to replace an existing asset, or as the first asset in a new project which, once started, would continue in-

⁶In the zero interest rate case, a perpetuity would have been an infinite amount.

TABLE 2

| | | | | | | $r=0.2$ |
|-----|-----------------------|------------------------------------|-----------------------|--------|-------|---------|
| n | $\frac{P_n}{(1+r)^n}$ | $\sum_{t=1}^n \frac{P_t}{(1+r)^t}$ | $\frac{S_n}{(1+r)^n}$ | PV | Z | |
| 1 | 83.3 | 83.3 | 16.67 | 0 | 0 | |
| 2 | 62.5 | 145.8 | 11.81 | 57.61 | 37.71 | |
| 3 | 46.3 | 192.1 | 8.1 | 100.2 | 47.57 | |
| 4 | 33.76 | 225.86 | 5.3 | 131.16 | 50.67 | |
| 5 | 24.11 | 249.92 | 3.22 | 153.19 | 51.22 | |
| 6 | 16.75 | 266.72 | 1.67 | 168.39 | 50.64 | |
| 7 | 8.37 | 275.09 | 0.56 | 175.65 | 48.73 | |



definitely. The way to approach the problem in this case is to look at the assets one by one. Work out the various annual equivalents for the asset for differing lengths of life – that is, find the n that maximises Z . Write down the optimal length of life for this asset and the annual equivalent of the present value of this asset run for its optimal life (Z with life of n^*). Carry out this procedure for all the assets under consideration. Select that asset which has the highest annual equivalent, and run this asset for its optimal life (n^*).

This procedure may not, however, locate the best strategy for the firm. It may be better for the firm to buy a second hand asset. The firm should therefore follow the procedure outlined above for all new assets. Then the same procedure should be followed for all second hand assets of a certain age. An optimal second hand asset would be the output from this procedure. Second hand assets of other ages could then be considered. The actual replacement should then be that asset which has the highest annual equivalent from the set of all new and second hand assets (of all ages).

Optimal life of an existing asset

An implicit assumption in the preceding section was the prospect of replacing an existing asset. On this basis, a procedure was described for finding the optimal replacement. Nothing, however, was said about the optimal time to change the old asset for the replacement one. (This, of course, assumes that the replacement asset will then be replaced by a similar asset indefinitely.)

Supposing that the annual equivalent values for the replacement (henceforward termed new) machine have already been calculated, then the optimal life for the new asset is known. A superscript of N and o differentiates the notation for the new and old assets respectively. The annual equivalent is given by:

$$Z^N = \frac{1}{a_{n|r}} \left[\sum_{t=1}^n \frac{P_t^N}{(1+r)^t} + \frac{S_n}{(1+r)^n} - Q_o^N \right] \quad (8)$$

This then defines the life of the new asset. The new machine should then be replaced when the marginal

contribution of the old machine falls below the new machine's annual equivalent that is, Z^N calculated with respect to n^* – the optimal life of the new machine. Formally this condition may be expressed in the following way: the optimal time to replace an existing asset is when⁷

$$Z^o = Z^N \text{ (with } Z^N \text{ calculated using } n^* \text{ – the optimal life of the new machine)} \quad (9)$$

where

$$Z^o = P_t^o + S_t^o - S_{t-1}^o(1+r) \quad (10)$$

This new term, Z^o , is the net cash inflow of the asset in year t (P_t^o) and the change in the value of the scrap proceeds. A change in the value of the scrap proceeds is an opportunity cost for the firm. If the scrap value is decreasing over time, then the change in the scrap value will be a potential reduction in the firm's cash flow. For the firm, in year t , can no longer sell the asset for S_{t-1}^o but has to be content with the amount S_t^o . The firm has therefore lost a potential cash flow of $S_{t-1}^o - S_t^o$ by keeping the asset one year longer. Interest is included in this calculation, since if the firm had sold the asset in question in year $t-1$, then it could have invested the funds for one year, thereby earning interest on the funds.

If, when this equation is calculated, it is found that⁸ $Z^o < Z^N$

then this implies that the optimal time to replace this asset was sometime in the past, and that money is being lost by not replacing the asset immediately.

The example given earlier can be used to demonstrate the application of formula (10). Assume that the example shown in Table 2 is the new asset and that it is replaced every five years (its optimal life) with another 'new' asset. The annual equivalent of this stream of cash flows is £51.2. Supposing the old asset has the following functional relationships:

$$P_t^o = 140 - 20t \text{ for } 1 \leq t \leq 7 \text{ otherwise } P_t^o = 0$$

$$S_t^o = 23 - 3t \text{ for } 1 \leq t \leq 7 \text{ otherwise } S_t^o = 0$$

All capital costs are sunk costs and therefore irrelevant.

The financial statistics for the old asset (given by the above relationships) are shown in Table 3.

⁷Assumes monotonic functions for P_t^o and S_t^o .

⁸Assumes that this is true for all t greater than the current time period.

TABLE 3

| n | P_t^o | S_t^o | $S_{t-1}^o(1+r)$ | $S_t^o - S_{t-1}^o(1+r)$ | $Z^o \text{ or } P_t^o + [S_t^o - S_{t-1}^o(1+r)]$ |
|-----|---------|---------|------------------|--------------------------|--|
| 1 | 120 | 20 | 27.6 | -7.6 | 112.4 |
| 2 | 100 | 17 | 24.0 | -7.0 | 93.0 |
| 3 | 80 | 14 | 20.4 | -6.4 | 73.6 |
| 4 | 60 | 11 | 16.8 | -5.8 | 54.2 |
| 5 | 40 | 8 | 13.2 | -5.2 | 34.8 |
| 6 | 20 | 5 | 9.6 | -4.6 | 15.4 |
| 7 | 0 | 2 | 6.0 | -4.0 | -4.0 |

The optimal life of the new machine is known to be 5 with an annual equivalent of 51.2. Then the old machine should be replaced at that time when the marginal contribution (i.e. Z^o) falls below 51.2. Using linear interpolation (which is appropriate since the function Z^o is linear) the old machine should be replaced on the 56th day of year 4, at five minutes past four in the afternoon.⁹

This situation is portrayed in Graph 2.

Time is represented along the horizontal axis and money is measured along the vertical axis. The function Z^o can be seen to cut the straight line given by Z^N at $t=4.15$. To change the old asset for the new asset before this time will lose the firm money, since the old machine is contributing more annually than

the annual equivalent of the new machine. After this point in time the new machine contributes more than the old machine.

A suggested alternative procedure

A. J. Merrett and Allen Sykes¹⁰ have suggested an alternative procedure. They suggest that the optimal life of an existing asset is the value of k which equates the following formula:

$$\sum_{t=1}^k \frac{P^o_t}{(1+r)^t} + \frac{S^o_k}{(1+r)^k} = \frac{Z^N}{(1+r)^k} \quad (11)$$

In Table 4 the left hand side of this formula is tabulated, using the same example as before.

⁹Since there are, say, 360 days in a year and
 $\left(\frac{54.2-51.2}{54.2-34.8} \right) 360 + 55.67$

¹⁰Page 490 in *The Finance and Analysis of Capital Projects*, Longmans Green and Co, Ltd, 1963.

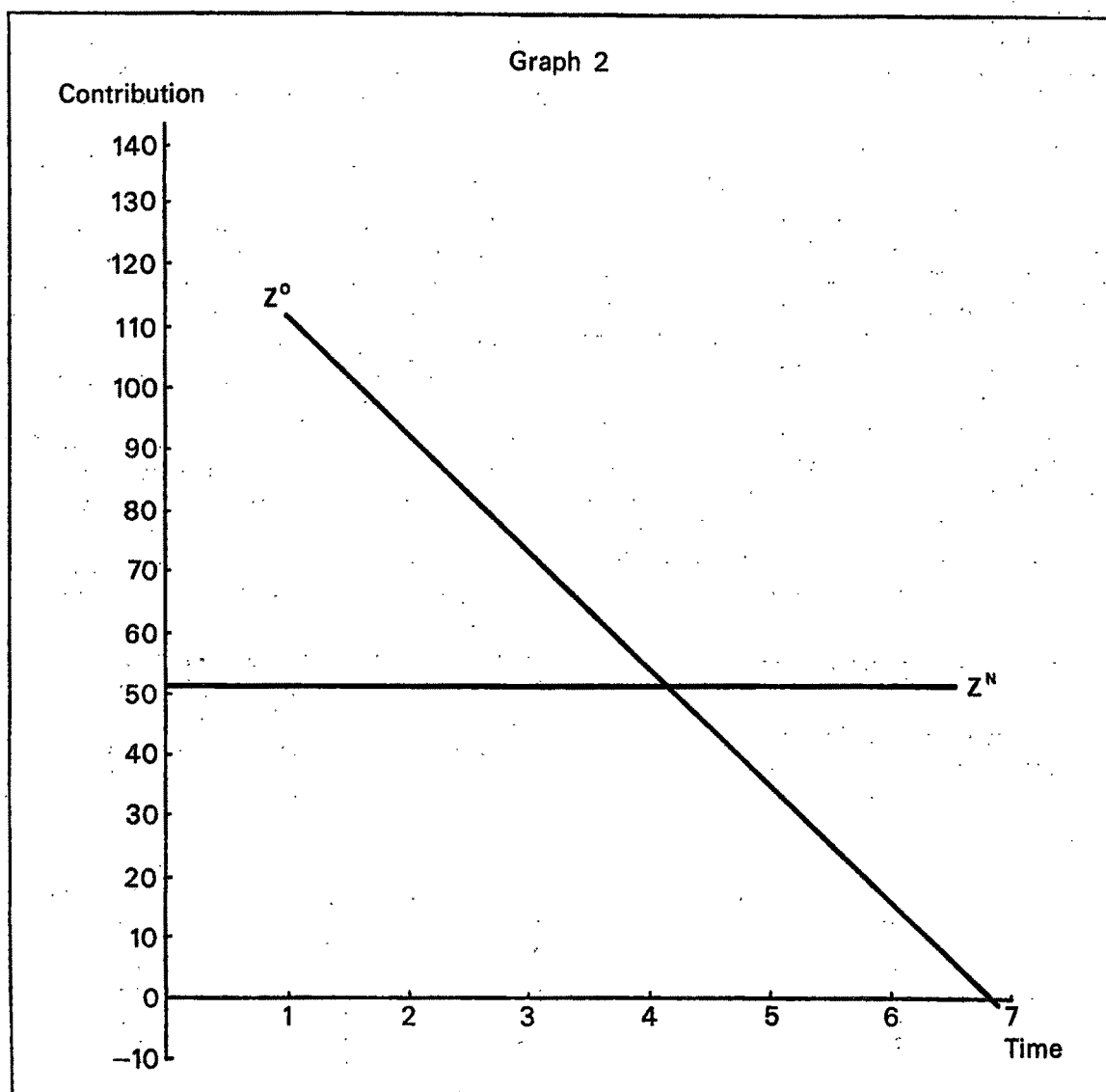


TABLE 4

| t | $\sum \frac{P^o_t}{(1+r)^t}$ | $\frac{S^o_k}{(1+r)^k}$ | $\sum_{t=1}^k \frac{P^o_t}{(1+r)^t} + \frac{S^o_k}{(1+r)^k}$ |
|---|------------------------------|-------------------------|--|
| 1 | 83.3 | 16.67 | 100.00 |
| 2 | 145.8 | 11.81 | 157.61 |
| 3 | 192.1 | 8.1 | 200.2 |
| 4 | 225.86 | 5.3 | 231.16 |
| 5 | 249.92 | 3.22 | 253.14 |
| 6 | 266.72 | 1.67 | 268.39 |
| 7 | 275.09 | 0.56 | 275.65 |

As can be seen from the right-hand column of Table 4, as long as P_t (the net cash inflow) and the scrap value (S_k) are not negative, there will be no value of k such that the Merrett and Sykes condition is satisfied. Their formula discounts everything back to year zero; the maximum Z^N of the new asset is then compared with the discounted P^o_t 's and S^o_k 's. The basic fallacy of this approach is that an element of past history is associated with any decision to replace the existing asset after year 1. For example, previously, using the formula advocated in this paper (that is, formula (10)), it was seen that the optimal time to replace this asset is in year 4. Looking at the Merrett and Sykes formula for year 4, it is found that the old asset has had the past net cash inflows added in to the cash inflow actually occurring in year 4. Basic decision theory warns everyone to treat past costs as irrelevant in making a decision. Merrett and Sykes (both public advocates of opportunity costs)¹¹ appear to have fallen into a trap. For it is obvious that in year 4, what happened to the asset in previous years is irrelevant. The basis for making the decision must be the following: are the marginal revenues (in the year in which the replacement occurs) less than or equal to the annual equivalent of the new machine? It is therefore recommended that formula (10) be used in this type of decision.

¹¹Pages 46 and 278, *The Finance and Analysis of Capital Projects*.

The pure retirement decision

The need for a particular asset may terminate with its retirement. This type of problem is similar to the previous one. In this case there will be no replacement, so that as long as the marginal returns of the asset are positive, the asset's existence is justified. The asset should be scrapped when:

$$Z^o < 0 \quad (12)$$

that is, when

$$P^o_t + [S^o_t - S^o_{t-1}(1+r)] < 0 \quad (13)$$

Assuming appropriately shaped functions, the optimal time to scrap the asset is when:

$$Z^o = 0 \quad (14)$$

To continue using the same asset until

$$Z^o < 0$$

implies that there have been some negative returns which could have been avoided had the asset been replaced earlier.

In the previous section, the 'old' asset was to be replaced by a new asset. If, on the other hand, it is assumed that the asset will not be replaced the date of retirement can be calculated. The financial parameters of the asset are shown in Table 3 and are portrayed in Graph 2 by Z^o . It is worthwhile retaining the asset until the 286th day of year 6¹², since up to this time the asset has a positive contribution to make to the firm.

Conclusion

A number of different types of decision problems have been dealt with, and it is hoped that the formulae in this paper will be of some practical use. Notwithstanding this, it must be appreciated that the world is a dynamic environment. One of the features of the dynamic environment is that machines, equipment and other assets are constantly being subjected to technical advances and innovations. Obsolescence and technical change are not catered for in many types of replacement decisions. A more sophisticated method of analysis, such as dynamic programming, is needed to overcome the restricting assumption of the infinite chain of replacements.

¹²By linear interpolation and assuming a 360 day year.

Appendix 1

Solution to optimal asset life by calculus:

Assume

$$P_t = P(t)$$

$$S_t = S(t)$$

Also let P and S be continuous and differentiable.

$$F = \int_0^n P(t) + S(n) - Q_0$$

Notice that

$$\frac{dF}{dn} = P(n) + S'(n)$$

Now our equivalent of expression (2) on the present value on an annual equivalent basis is

$$Z = \frac{F}{n} = \frac{1}{n} \left[\int_0^n P(t) + S(n) - Q_0 \right]$$

To maximise we require $\frac{dZ}{dn} = 0$ and $\frac{d^2Z}{dn^2} < 0$.

$$\text{Now } \frac{dZ}{dn} = \frac{F'}{n} - \frac{F}{n^2} = 0$$

$$\text{or } F'n - F = 0$$

$$\text{or } n = \frac{F}{F'}$$

thus, first order condition is that

$$n = \frac{\int_0^n P(t) + S(n) - Q_0}{P(n) + S'(n)}$$

In Table 5 below we calculate $\frac{F}{F'}$, for the example described in Table 5.

TABLE 5

| t | F | F' | $\frac{F}{F'}$ | Z value from Table 1 |
|---|-----|----|----------------|----------------------|
| 1 | 20 | 97 | 0.21 | 20 |
| 2 | 107 | 87 | 1.23 | 53.5 |
| 3 | 184 | 77 | 2.39 | 61.33 |
| 4 | 251 | 67 | 3.75 | 62.75 |
| 5 | 308 | 57 | 5.4 | 61.6 |
| 6 | 355 | 47 | 7.55 | 59.17 |
| 7 | 392 | 37 | 10.59 | 56 |

It yields the same answer as selecting the highest Z , since the closest $\frac{F}{F'}$ value to time is 3.75 which yields

an optimal life of four years. Finding the solution by calculus with continuous time discounting is more complex.

Looking at the perpetuity $\frac{Z}{r}$, it now becomes

$$\frac{Zr}{r} = \frac{1}{1 - e^{-rn}} \left[\int_0^n P(t)e^{-rt} dt + S(n)e^{-rn} - Q_0 \right]$$

The first order condition is $\frac{dZ}{dn} = 0$ and is equal to

$$\begin{aligned} \frac{dZ}{dn} &= P(n) - r \cdot S(n) + S'(n) \\ &- r \left[\int_0^n P(t)e^{-rt} dt + S(n)e^{-rn} - Q_0 \right] = 0. \end{aligned}$$

The above expression is more complex to work out and further discussion of this problem can be found in P. Masse, *Optimal Investment Decisions*, pages 61-81, though there is not a one to one correspondence between this analysis of optimal asset lives and Masse's.

Book Reviews

The Evolution of the Theories and Techniques of Standard Costs *Ellis Mast Sowell*. (The University of Alabama Press)

This work is the embodiment of extensive research into the literature of its subject; it is a detailed and exhaustive historical survey drawing on a wide range of sources of varying degrees of importance. Certain of Dr. Sowell's references to these sources are necessarily rather fragmentary and are perhaps inadequately supported by critical commentary from the author. The works of other writers, notably G. Charter Harrison, are referred to in much greater depth, as befits their contributions in this field.

The origins of standard costing are logically founded in the concept of estimated costs. It is therefore appropriate that Dr. Sowell should begin his survey with an investigation into the evolution of the cost estimate, in the sense of a pre-determined approximation of actual cost as opposed to one based on a process of scientific fact finding. The various applications of the cost estimate are traced through to the early 1940's from the early guild and domestic systems of British industrial development. During the phases covered by this period the cost estimate had respectively served the purpose of a check on the integrity of craftsmen, as a means of preventing the embezzlement of materials, and as a basis for tendering or price determination. It was, however, approaching the end of the 19th century, about which time the engineers' estimating procedures tended to be replaced by cost accounting methods, that emphasis was laid on the importance of comparisons between estimates and actual figures.

Dr. Sowell's third chapter is concerned with the evolution of procedures for dealing with 'cost estimate variations' as advocated in early cost accounting literature, namely, Garke and Fells (1887); G. P. Norton (1889); and an article by R. Whitehill (1894); by authors during the first two decades of the 20th century; and in literature subsequent to 1920.

Due recognition of the contributions of both industrial engineers and accountants to the development of standard costs is given by the author in Chapter 4, 'The Background of Standard Costs'. Adopting the view taken by G. Charter Harrison, the author does in fact give credit to the engineer for the underlying idea embodied in the forward-looking approach required in the setting of standards; he cites as further specific examples of their contribution the introduction of incentive wage schemes, as advocated for example by Henry R. Towne, F. A. Halsey, F. W. Taylor, and H. L. Gantt; time-

study and rate-fixing procedures; and recognition of the 'principle of exceptions', the importance of which was emphasised by Taylor in 1911.

Dr. Sowell's discussion of the cost accountants' contribution begins with a description of the procedure advocated by George P. Norton in his book 'Textile Manufacturers' Book-keeping' published in 1889; a procedure in which actual factory production costs were compared with accepted 'trade prices' (i.e. prices which would have been charged by outside specialists), to generate what has been referred to as the earliest example of standard costing, and which was certainly an important step in the evolution of full standard costing as we know it today. The works of other writers contributing to the evolutionary process are considered in varying degrees of detail and among those singled out by Dr. Sowell for contributions of some significance are H. Stanley Garry (the conversion of factory production into standard units of output); A. Hamilton Church (the recognition of independent factory production centres); and John Whitemore (the recognition and treatment of idle capacity). The contributions of several other writers are mentioned, but it is to the work in 1909 of Harrington Emerson, the American efficiency engineer, that Sowell suggests should be attached the greatest significance as a forerunner of standard costs. In discussing Emerson's efficiency concepts Dr. Sowell concludes, however, with the observation that he (Emerson) had '... recorded certain cost data that still required the refinement of an individual with accounting training before a standard cost technique could be recognised'.

In 1918/19, a series of articles, subsequently published in book form, appeared under the authorship of such a person, namely G. Charter Harrison, an English Chartered Accountant who had emigrated to the USA where he had not only practised as a public accountant but had also been engaged as a 'comptroller' and as a cost consultant. Dr. Sowell accepted Harrison's cost procedures, as set out in 'Cost Accounting to Aid Production' as 'the initial effort to present standard cost principles in a unified and concise series of articles', and to mark the importance which he attached to Harrison's work he devoted to it the whole of Chapter 5, entitled 'G. Charter Harrison's Early Contribution to Standard Costs'. That Dr. Sowell was not alone in this view is evidenced by the comments of Professor David Solomons, who writing in 1952* referred to Harrison's series of articles, written in 1918, as having 'a sureness of touch and a comprehensiveness in their

treatment which shows standard costing to have left the experimental stage and to have attained the status of established practice'.

In Chapter 6, 'The Development of Standard Cost Principles', Dr. Sowell has attempted to restate such 'principles, techniques, and/or methods' which have emerged from his study of the literature on standard costs since G. Charter Harrison's initial work on the subject in 1918. His opening sections of this chapter dealing with some important factors in, respectively, the early development and the later development of standard costs, are mainly concerned with the recognition given to standard costs by individual writers and international conferences, culminating with evidence from the literature that standard costing had indeed finally arrived. Despite this, however, there appears to have been some confusion in the minds of some English and US authorities around the period 1920-30 between 'standard costing' and 'uniform costing'. The greater part of this chapter is devoted to 'Types of Standard Costs' (mainly concerned with the use of 'current' as opposed to 'basic' standards, and the conceptual nature of 'current' standards), and to 'Standard Cost Accounting Procedures'. The author's survey of the literature on this latter aspect showed three general classifications of procedures employed for incorporating standard costs into an accounting system, namely: (a) as statistical data in subsidiary records, (b) as memoranda data in the ledger accounts for comparative purposes, implying the use of 'basic' standards, and (c) as operational data for valuation purposes. Further topics of importance briefly covered relate to 'The Principle of Exceptions in Standard Costs', and 'The Relation of Standard Costs to Budgets'.

The remainder of the book, apart from the final chapter which sets out the author's conclusions, extends the broader features discussed in earlier chapters to a detailed analysis of their application to the respective cost components.

In the penultimate paragraph of his book Dr. Sowell, referring to the development of standard costs within an industrial environment market by expansion and progress, states: 'If, from the information that has been presented, it may be concluded that standard costs have moved with this industrial trend, then the logical induction seems to be that these scientific, predetermined costs possess characteristics that are capable of continuing to advance and expand with the industrial movement'. This assertion seems to prompt two related questions;

firstly, has the development of standard costs in fact kept pace with industrial progress? and secondly have such developments reduced substantially the value of a book originally produced in manuscript form some thirty years ago?

Ignoring the progress made with other methods of control, the answer to the first question must certainly be that developments have undoubtedly taken place in the field of standard costing. Some of these developments have, for example, taken the form of refinements in variance analysis, cost control charts, the application of statistical methods to cost estimating and the use of probabilistic data, improved methods of cost analysis based on multiple regression analysis, and the increased attention paid to the behavioural aspects of the use of standards and budgets.

Such developments obviously detract to some extent from the value of a book written even before the advent of the first generation of computers, and on these grounds it must necessarily be of limited value to a practitioner whose main concern is with current developments and modern techniques. The numerous illustrations of accounting procedures do of course indicate trends of thought of the various authorities cited, but these are mainly of interest in an historical setting.

All these points of criticism must however lose much of their validity when the book is evaluated, as indeed it must be, as a review of the literature. As such it is a monumental work, the product of obvious dedication and laborious research into sources, and an important work of historical reference. Its appeal to accounting historians and research workers in this field is obvious.

H. HART.

Financing Decisions in Business, John Freear, (Accountancy Age Books, Haymarket Publishing, £3) Mr Freear's book belongs to the Accountancy Age Modern Finance Library. The aim of the series is to provide a range of texts suitable for use on accounting and business finance courses, as well as being of interest to practitioners of accounting and financial management. The contribution of the series promises to be its treatment of the subject against an up to date United Kingdom backcloth.

Financing Decisions in Business is a valuable contribution to the series. The author has recognised the conceptual and pedagogic merits of presenting corporate financing decisions, the individual's financial decisions and the institutional environment in a single framework.

The text is divided into four parts. The first, entitled Conceptual Structure, relates the finance

*The Historical Development of Costing—D. Solomons. 'Studies in Cost Analysis' (D. Solomons, ed.). The Law Book Company Limited, Australia, 1968. Pp. 46/47.

function to the overall corporate objective and to the financial decisions of the individual. Alternative investment decision rules are presented in a very brief space—but Professor Carsberg comments in the preface that the book should be read in conjunction with the forthcoming volume *Analysis for Investment Decisions*. The next part—Decision Environment—describes the sources of finance and places the financing decision into its institutional context. Part Three—The Individual's choice of Securities—introduces the reader to the problems of portfolio decisions. Measurement of risk is considered. Part Four, entitled Company Financing Decisions, is mainly concerned with the interdependence of the components of the financing structure and the optimal financing problem. A final chapter examines the merger decision.

The emphasis in recent literature (for example, R. A. Fawthrop, 'Underlying Problems in Discounted Cash Flow Appraisal', *Accounting and Business Research*, Summer 1971, and D. Chambers, 'The Joint Problem of Investment and Financing', *Operational Research Quarterly*, September 1971) on the interdependence of the investment and financing decisions raises the question of whether it is desirable to separate the treatment of the two, even between two volumes of a single series. Might it have been possible to integrate the subjects into a single volume and yet remain within the limits of size required for the series?

The author of a book of this sort must inevitably be selective, bearing in mind the size of text he is aiming to produce and the pitifully small amount of time allocated to business finance in many degree schemes. Subject to this caveat, the reviewer has noted a few matters which might usefully have been pursued. There is the constraint on debt capacity imposed by a company's prospective

liquidity in recession conditions¹; the doubts which have been cast on the soundness of an annual discount rate as the basis for a company's cost of capital²; the difficulty of quantifying the cost of capital for each type of finance³; and doubts about the operational usefulness of a unique corporate cost of capital⁴.

Mr. Freear's book should prove a useful 'core text' for undergraduate courses. The frequent references to more specialised and analytical texts are helpful and, supplemented with suitable readings, the book could provide the basis for a full session's teaching. A reading list would have made it even more useful.

At postgraduate level it will serve as an introductory text for students specialising in finance, and as a course-text for non-specialists.

The book will be of interest to practising accountants and financial managers, as private students or in preparation for an 'in-company' or business school executive course. They will particularly welcome Mr Freear's coverage of a wide subject area in a concise space, the carefully planned and clear construction, and the author's awareness of the practical constraints as well as the theoretical framework of the financing decision.

ROGER LISTER.

¹Cf. G. Donaldson, 'Corporate Debt Capacity', Harvard University Press, 1961. G. Donaldson, 'New Framework for Corporate Debt Policy', *Harvard Business Review*, March-April 1962.

²Cf. E. F. Fama and M. H. Miller, 'The Theory of Finance', Holt, Rinehart and Winston, 1972, pp. 281-184. R. M. Adelson, 'D. C. F.—The Other Point of View', *Moorgate and Wall Street*, Spring 1971.

³Cf. A. J. Merrett and A. Sykes, 'Return on Equities and Fixed Interest Securities: 1919-1966', *District Bank Review*, June 1966.

F. B. Pizzala, 'The Cost of Capital to the Private Sector: A Critique of Merrett and Sykes', *Moorgate and Wall Street*, Spring 1972.

⁴Cf. G. Donaldson, 'Strategic Hurdle Rates for Capital Investment', *Harvard Business Review*, March-April 1972.

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Volume 3 No 12 Autumn 1973

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Accounting and Business Research

Accounting and Business Research

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City House, 55–66 Goswell Road, London EC1 Tel: 01-628 7060

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Accounting and Business Research

**A Research Quarterly
published by
The Institute of Chartered Accountants
in England and Wales**

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Stock Valuation Practices in Consumer Durables Manufacturing Industry

B. C. Dangerfield and E. Stephenson

Introduction

The investigation described here is concerned with the stock valuation practices of a sample of firms in consumer durable manufacturing industry and was part of a major project relating to inventory decision processes in this industry. A relatively small sample of firms (25) participated in the project, these firms manufacturing a broad range of products from electric irons and step ladders at one end to motor cars at the other. The nature of the manufacturing process was wholly flow line final assembly work with batch production operating in the sub-assembly, machine shop or press shop areas. The firms were visited over a period of one year from January 1972 to January 1973 and discussions, based on the questionnaire given in Appendix 1, took place with company accounting personnel regarding stock valuation practices. One firm did not participate in the interviews and their co-operation was limited to the supply of time-series data on stock levels.

The number of employees was arbitrarily chosen as an index of firm size and, for each of the firms from which data were collected, the total number employed only at the factories or divisions of the company to which visits were made was obtained. A frequency distribution of the total number of employees is given in Appendix 2 showing that a large percentage (68%) of firms investigated employed less than 3,000 people. The smallest firm co-operating employed 108 persons, the largest 18,465 and the median total number of employees was 1,280.

Each firm was asked to give a breakdown of the total value of their productive stocks as at the last annual stock-take. It was felt that, since the major purpose of the project was to investigate the inventory decision-making process and inventory behaviour, consideration of productive stocks only would provide a logical basis for the investigation and therefore such items as stocks of consumables or spares were not considered. A frequency distribution of the value of

total stocks held by participating firms as at their last annual stock-take is given in Appendix 3. This shows that the majority of firms (60%) reported a total stockholding value in one of the four lower groupings which was up to £2 million. The lowest total stock valuation reported was £38,000, the highest £34,000,000 and the median value was £1,635,000. The breakdown into categories of stock is given below:

| | | |
|--------------------------|-------------|--------|
| Materials and components | £18,529,600 | (20%) |
| Work-in-progress | £35,961,800 | (40%) |
| Finished goods | £36,503,400 | (40%) |
| Total | £90,994,800 | (100%) |

Because accounting definitions of what constituted work-in-progress differed between firms, the split between materials and components stock and w.i.p. stock in a number of cases had to be decided arbitrarily. Further, although bought-out components were most often reported with the material stock value, in some cases the figure was lumped with the work-in-progress valuation and it was not possible to disaggregate the two. The figure given above for finished goods stock would be higher if the investigations had also taken in the sales division of seven participating firms. In these seven cases, for various reasons, it was not possible to obtain the co-operation of the sales division with the result that the investigation had to concentrate solely on the manufacturing aspects. Finished goods stock held at the manufacturing points in these cases was either non-existent or of an insignificant quantity. Excluding these seven firms, the breakdown in the sample values of total stocks is materials and components 18%, w.i.p. 38% and finished goods 44%. The higher percentage figure for finished goods stock than that quoted earlier represents a more accurate picture of the relative importance of this category in consumer durable manufacturing industry and reflects the fact

that these firms manufacture for stock unlike the capital goods industries which manufacture to order.

In order to gauge the size of the above sample relative to the national total it is necessary to determine the book value of (i) materials and components (ii) work-in-progress and (iii) finished goods in the relevant Department of Trade and Industry grouping (Engineering, shipbuilding, vehicles and metal goods) at an appropriate date. The DTI statistics for end-1971 stock valuations were chosen for the purpose of estimating the value of stock held on a national basis and although not all firms' financial accounting periods would coincide with this date it was considered to be close enough for the present purpose of estimating the relative size of the sample. The estimate of the book value of total stocks held at end-1971 in the group 'Engineering, shipbuilding, vehicles and metal goods' is based on the assumption that the escalation factor applied to the value of stocks at 1963 price levels is the same for this group as for manufacturing industry as a whole. The value obtained was £4,982,983,000 and the sample total of stocks £90,994,800 represents 1.8% of this figure.

(Source of basic statistics: Trade and Industry, 5 April 1973, Volume 11, No. 1, pp. 54-57).

Responsibility for and nature of stock valuation

The table below gives a summary of replies to the question seeking information on the name of the specific section responsible for the preparation of estimates of stock values and w.i.p. Where the preparation involved an equally shared responsibility between departments then a score of 0.5 was credited to each.

| | | |
|--------------------------------|-----|------|
| Cost section or department | 9.5 | 40% |
| Administration | 1 | 4% |
| Financial Administration Dept. | 4.5 | 19% |
| Inventory Accounting | 2 | 8% |
| Accounting | 5.5 | 23% |
| Works Budget | 0.5 | 2% |
| Buying | 1 | 4% |
| | 24 | 100% |

With the exception of a small firm, where the Buying Department provides the stock valuation figure for manufacturing items, the provision of stock value estimates can be seen to be almost wholly the responsibility of an accountancy department operating under whatever name the individual company regards as the most suitable. The distinction between whether the Costing Department or a Financial Accounting Department were responsible for the stock values

showed no relationship to the frequency of adoption of standard costing techniques discussed later.

The stock value estimates are generally based on physical quantities supplied by the relevant department; in the case of materials and components the data are supplied by the purchasing or production control department and in the case of finished goods by the sales or distribution department. The stock values provided are most often broken down into the separate categories of (i) raw materials/components, (ii) w.i.p. and (iii) finished goods and are based either on a valuation of the physical book estimates for each individual item or product, summed over all items/products, or on an aggregate cash value of the flow of goods as follows:

Stock at end of period 2 = stock at end of period 1
plus (Cash value of all
input to stock minus cash
value of all output from
stock)

This latter procedure is utilised only by firms which treat stock on an aggregated basis without differentiating between items.

All except two firms reported that monthly stock evaluations were prepared, usually split into the broad categories mentioned above. It would appear from comments made that the trend towards a pattern of monthly reporting on stock values follows the overall growth of a firm's accounts and statistical reporting. In the early stages of the growth of a firm stock values may be prepared merely to comply with the legal requirement of once per year but this is usually extended to a quarterly evaluation and finally to a monthly one as the need for stricter financial control grows.

Seasonality of demand

Seasonal influences have repercussions for the level of finished goods stock during the year and all but two firms reported a seasonal component to final demand for their products. Stock levels of finished goods are above average just prior to the peak selling season and, since production is divorced from the seasonal component in the final demand, below average after the peak selling season.

Of the 22 firms which reported a seasonal component, 20 stated that production was kept fairly even throughout the year, the stocks of finished goods buffering seasonal demand changes. The two exceptions to this approach had the advantage of the availability of a pool of labour in the locality for a twilight shift, thus enabling a significant increase in production during certain months of the year. An analysis of the seasonal component, showing the time of year finished goods stock levels would be expected to be

above average, is given below:

| | |
|-----------|------|
| Autumn | 39% |
| Spring | 25% |
| Midsummer | 7% |
| Christmas | 29% |
| <hr/> | |
| | 100% |
| <hr/> | |

It should be stressed that seasonality is a factor affecting only finished goods stockholding since materials, components and w.i.p. stockholding is directly related to production which, as noted above, is almost always relatively steady throughout the year.

Length of time that stock is held

Generally the types of product covered during the research were fairly fast moving consumer durable goods and this fact is brought out in the responses to the question relating to the length of time that stocks are held. The average length of time that firms claimed materials were held was 6.7 weeks (Lowest 4 weeks: Highest 16 weeks), the comparable figure for principal component parts being 6.2 weeks (Lowest 2 weeks: Highest 16 weeks). Included in these estimates were ten firms for which it was not possible to disaggregate the two categories of materials and principal component parts and the assumption was made therefore that stockholding times for these two categories were the same. A further estimate omitting these ten firms yielded an average holding of materials of 6.2 weeks (Lowest 4 weeks: Highest 10 weeks) and an average holding of principal component parts of 5.4 weeks (Lowest 2 weeks: Highest 12 weeks). For the ten firms which merely computed an aggregate figure for the two categories the average stockholding time was 7.3 weeks (Lowest 4.5 weeks: Highest 16 weeks).

It is to be expected that the average stockholding of materials is higher than that for principal component parts except for radio and television manufacturers where components only are stocked. Primarily steel is used as a basic material in the bulk of consumer durable manufacturing operations and is subject to machining and/or pressing in a batch production environment prior to being used in final assembly. The operational requirements of batch production in a machine or press shop will require larger stocks of materials compared to the requirement for principal component parts since the demand for the latter is generally determined by the requirements anticipated on the final assembly line. The basic problem for final assembly is correct phasing of requirements whereas, in machine or press shops, economic run lengths assume prime importance.

Investigation of fuel stocks revealed that two firms did not hold any because their source of power and heating did not require it and a further 11 firms could not quote an average stockholding because it was insignificant in terms of both value and equivalent day's usage. The average holding of fuel by the remaining 11 firms represented 2.8 weeks' demand but this estimate should be regarded as uncertain since the reporting and control of fuel stocks in this particular industry was not accorded great importance and was certainly not the responsibility of the department which controlled material and component stocks.

For finished goods stockholding the picture was distorted, as mentioned earlier, by the fact that 7 of the firms investigated were manufacturing concerns only, and for these the stock of finished goods held was either non-existent or extremely small. Daily despatches from the end of the assembly line ensured this state of affairs and therefore responsibility for finished goods stock passed to the selling and distribution side of operations. However, it was possible in 2 of these 7 cases to obtain a good estimate of stock levels and movements of finished goods, and an average over the 19 reporting firms gave a holding time of 14.4 weeks. The dispersion of the level of stockholding about the average in the case of finished goods is higher than that for materials, principal component parts and fuel. Figures quoted range from 1 week to 20 weeks and although some of this can be readily explained by seasonal movements, there is superimposed a cyclical component.

The industry under investigation is notorious for the cyclical tendencies in customer demand. During a boom period, which existed for virtually the whole of the duration of the fieldwork, demand can be such that a negative stock position exists on a large number of finished goods lines, i.e. there are more orders on hand than stocks in the warehouse at any given time. In contrast, during periods of depressed consumer spending, finished goods stocks are built up, primarily because the alternative of a cut in production is anathema to a large number of firms, and warehouses are packed to capacity. Because of these cyclical effects the average figure of 14.4 weeks equivalent stockholding can vary significantly from year to year.

The method of determining the length of time for which stock is held would appear to follow a fairly consistent pattern and essentially the calculation involves dividing the average stockholding into the input or output from stock, summed over a period of time, and converting this 'turnover' figure into weeks. All calculations were carried out in the accounting department, in some cases on a regular basis and used as part of the overall inventory control system.

For materials and components the average stock-holding may be related to either production or sales although a difficulty exists with a sales related figure since seasonal variations may distort the calculation of average stock levels or average sales. Although criticisms can be made of the particular methods adopted, to the individual firm these are of little concern since, using the results as an instrument of control, all that is needed is a figure derived on a consistent basis from one year to the next.

One slight variation of the above approach, which was adopted by two firms, is to calculate an average day's usage (or demand) by dividing the number of working days elapsed into the cumulative value of production, the cumulative material content of production or cumulative sales. This figure would then be divided into the average stock figure to give an equivalent number of days stockholding.

Comprehensive valuations of stock

The vast majority of firms (83%) comprehensively valued their stock either once or twice per year, as detailed below:

| | | |
|------------------------|-------|-------|
| Once per year | 11 | 46% |
| Twice per year | 9 | 37% |
| Three times per year | 1 | 4% |
| Continuous stocktaking | 3 | 13% |
| | <hr/> | <hr/> |
| | 24 | 100% |
| | <hr/> | <hr/> |

Three firms operated a system of continuous stock-taking which eliminated the need to carry out an annual or six-monthly stock count. Following this system ensured that all items would be counted at least once per year and therefore the book stock value would be acceptable for the balance sheet at year-end.

Management accounts reporting and Financial accounts reporting

Nineteen firms, representing 79% of the sample, prepared regular monthly stock valuations at standard cost. Of the remaining 5, two small firms did not prepare monthly estimates of stock values but one of these indicated that a standard costing system would be instituted in the near future. The remaining 3 carried forward estimates at latest average actual cost and, while this may appear to be a different procedure from that adopted by firms using standard costs, the distinction hinges on how the 'standard' is compiled, mention of which is made later. Two of these latter 3 firms were firms operating a system of continuous stocktaking.

It is well-known that stock valuation practices

used each month-end during the financial year may differ from those used for the preparation of the financial accounts and the balance sheet published at the year-end. The Accounting Standards Steering Committee (ASSC) in their Exposure Draft 6 on 'Stocks and Work-in-Progress' recommend that year-end valuation be at the lower of cost or net realisable value. The firms in our sample attempted to follow this recommendation in a variety of ways but 13 firms (54%) claimed there was no change from their procedures for internal accounting when preparing the year-end financial accounts. Three firms out of this group of 13 indicated that if the standard cost valuation at year-end exceeded the net realisable value, then the latter valuation would be employed in the preparation of the financial accounts. In the current inflationary conditions, however, the likelihood that standard costs would exceed net realisable value is fairly small.

As previously stated two firms did not prepare regular monthly stock valuations and the remaining 9 firms in the sample (38%) reported that differences existed between the preparation of monthly stock valuations and the year-end (or half year-end) financial stock valuation.

A classification of these differing procedures is given below:

| | No. of Firms |
|---|-----------------|
| Standard costing during the year; revaluation at lower of cost or market value at year-end. | 1 |
| Standard costs and variances during the year; revaluation at lower of cost or market value at year-end. | 1 |
| Standard costing during the year; adjustment for variance incurred up to year-end. | 1 |
| Standard costing during the year and variances for finished goods only; valuations for year-end at old standards but a proportion of the material price variance is added in. | 1 |
| Standard costing during the year; lower of actual cost or market value at year-end except for w.i.p. which is left at standard. | 1 |
| Standard costing during the year; valuation at <i>new</i> standards in the financial accounts, i.e. the standards to operate for 12 months from the day following the balance sheet date. | 1 |

Standard costing valuations at the *new* during the year; standard for material prices but the old standard for labour and overheads at year-end.

Standard costing revaluation at latest actual during the year; for (any) labour charges in excess of standard at year-end while (any) material excesses charged at an agreed percentage over the standard in use 3 months prior to the year-end.

Standard costing adjustments made to the during the year; valuation at year-end to compensate for the fact that the balance sheet valuation is based on that existing 2 months prior to the year-end.

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Altogether 19 firms (79%) in the sample operated a standard costing system including all 9 firms referred to above. The remaining 10 firms used the stock valuation, based on standard costs, in the year-end accounts with no change whatsoever, except for the 3 firms previously referred to that mentioned an unlikely conversion of the valuation to net realisable value where the standards had exceeded such a valuation. It should be stressed that although these 10 firms allowed the standard valuation to be used in the financial accounts this would have been agreed with the auditors and the valuation would be backed by a count thereby divorcing it from a book estimate.

The table below classifies the responses to the questions about the use of standard costing and the employment of revised procedures for stock valuation at year-end.

The frequency with which practices followed by firms during the year differ from those for the year-end stock valuation highlights a basic problem in the collection of quarterly statistics on stock values,

which is that in the absence of specific DTI guidelines it is possible that returns made for three of the four quarters in a year may be compiled on a different basis to the final quarter's return.

Valuation of stocks – materials, components and finished goods

Particular Methods of Stock Valuation; Materials and Components

Reference has already been made to the division in the sample between firms which operated a standard costing system and those which employed latest actual or progressive average costing methods. Five firms adopted the latter approach, the latest actual prices for valuation purposes being taken as current invoice prices paid. If an item was procured from more than one supplier then the prices would be averaged over all suppliers should they differ from one supplier to another.

With regard to the 19 firms which utilised standard costing, a closer analysis of the way the standards were arrived at and operated during the year revealed that 13 of the 19 firms (68%) attempted to keep the standards up-to-date *during* the year. The particular methods used by the 19 firms can be categorised into four broad approaches as follows:

| | | |
|--|----|--------|
| 1. Including price and wage increases anticipated during the year when setting the standards at the start: | 8 | (42%) |
| 2 Incorporating price variances when valuing stocks during the year: | 1 | (5%) |
| 3 Review and possible adjustment of standards made periodically during the year: | 4 | (21%) |
| 4. Standards set and remain at prices/wages prevailing at the start of the year: | 6 | (32%) |
| | 19 | (100%) |

In the normal course of events the new standards are set some 3–4 months prior to being used; this is unavoidable since the administrative and computational procedures cannot be undertaken in a matter of weeks. Thus in periods of rapid inflation it is

| | <i>Valuation procedures different at year-end</i> | <i>Valuation procedures unchanged at year-end</i> | <i>Totals</i> |
|---------------------------------|---|---|---------------|
| Employed standard costing | 9 | 10 | 19 |
| Did not employ standard costing | 0 | 3 | 3 |
| Totals | 9 | 13 | 22 |

possible that some of the new standards would be out-of-date before they were used. Because of this the 8 firms, referred to in the table above, in setting new standards for the next financial year took account not only of the price rises that were anticipated by the buyers and wage awards expected to be made to production personnel during the course of the new financial year, but also of increases which were likely to occur before the new standards became operative. The single firm listed in the table indicated that price variances were taken into account during the month-end valuations of stock, as opposed to the normal practice of writing variance account entries to the profit and loss account and leaving the valuations at standard cost.

Periodic reviews during the year of the standard costs in use were made by 4 (21%) of the 19 firms and in two of these an index was applied to the valuation of materials and components stocks where price increases in any one month exceeded a given percentage. A third firm of the 4 reported valuing all inputs (purchases) to stock at actual and reviewing the standards each quarter as it was felt that in this manner the standard valuation would keep abreast of the actual valuation. Should the standard valuation be continually exceeded it could affect the transfer prices of finished goods to the sales organisation. Finally, the fourth firm stated that standards for materials and components purchases would be changed at each month-end, where prices had changed, but for finished goods the standard value would be assessed at the end of each quarter. The remaining 6 (32%) of the 19 firms set and operated standards which conformed to price and wage levels prevailing at the start of the year. Where this approach is followed then in times of rising prices the standard costs will always lag behind the actual costs.

Apart from the 4 firms referred to in the previous paragraph, the remaining 15 set the standard cost to operate from the start of the financial year. The specific dates on which the new standards came into use were as follows:

| | |
|------------|----|
| 1 April | 7 |
| 1 January | 4 |
| 1 December | 1 |
| 1 November | 1 |
| 1 July | 1 |
| 1 March | 1 |
| | — |
| | 15 |
| | — |

It was stressed by most of the accountants interviewed that the concept of 'net realisable value' or 'market value' was used only in the circumstances of obsolescence of the item concerned. If the items which

fell into this category could not be returned to the manufacturers and a credit obtained then the valuation price was either the scrap value or the price that could be obtained from any other firm which might still require such items.

The Valuation of Finished Goods Stock

In common with most manufacturing systems the costing of consumer durable finished products is based on the value added to the product at each stage to its final complete stage. This costing is based on the material price and direct labour input using whatever costing system the firm employs, standard or actual. The methods of material and labour costing have already been referred to especially in the setting of standards at the start of the year. One distinction found, however, was whether or not overheads were included in the finished goods valuation and, if so included, on what basis this was done.

Only 2 firms (8%) of the 24 reported that overheads were not included in any stock valuation; in these cases overheads were recovered on the sale of the product. Particular overheads apportioned to the valuation of stock in the other 22 firms (92%) were such as indirect labour; rectification; heat, light and power; consumables and small tools. Of these 22 firms 19 were able to quote the percentage of the valuation taken up by overheads, the remaining 3 were manufacturing units only and the relevant data were held by the selling organisation. The average proportion of the valuation of finished goods claimed by overheads in these 19 firms was 22.2%, the proportion quoted ranging between 5% and 43%. In the case of firms which factored finished products, overheads would naturally not be included in the valuation which would be at invoiced or standard prices.

Nine firms stated that the overhead allocation was related to the direct labour component in the product. In fact this seems a common practice and, although there is unlikely to be any scientific justification for the relationship between direct labour and overhead allocation, there are grounds for assuming that more firms than those which specifically mentioned the fact do make use of such a relationship. On average, overheads are recovered at the basis of 175% of direct labour (Lowest 150%: Highest 250%).

Turning to the percentage of the total value of finished goods claimed by direct labour it was found that this averaged 9.7% for the 19 firms mentioned above, the quoted percentages ranging between 2% and 20%. It follows that the valuation of an average finished product in this type of industry contained 68.1% material, 9.7% labour and 22.2% overheads where firms appropriated all three to the final valuation.

The determination of the labour rate applied to each operation during manufacture of the finished product is made from a combination of work study information and a wage rate. The wage rate would be applied to differing grades of labour, where this situation existed, and would be based on actual rates paid or, where a standard costing system was used, on either the rates ruling at the start of the year or an average wage rate expected for the whole of the year and thus inclusive of anticipated wage increases. The split between firms which attempted to incorporate likely wage increases into the standards set at the start of the year broadly followed that for likely price increases discussed earlier.

None of the firms questioned claimed there were differences between the valuation of finished goods at the factory and in any distribution depot or warehouse which they owned.

The Valuation of Imported Items

It was claimed by 20 (83%) of the 24 firms in the sample that duty, carriage and freight were included in the valuation of imported stock. This means that either the standard cost incorporates these elements along with the material price or that the costing system is at actual. One firm reported that duty alone was included in the valuation while a further one firm did not import anything. It is perhaps worth noting that the remaining 2 firms did not include items such as duty, carriage and freight in the valuation, it being argued by one that any appraisal of a buyer's performance through the standard costing system would be distorted if the effect of changes in these items were included.

Trade and Cash Discounts and Stock Valuation

All 24 firms reported that cash discounts were not taken into account for stock valuation purposes. However there was a more varied response to the same question concerning trade discounts, 9 firms (38%), of the 24, reporting that trade discounts were taken into account. Several firms which operated a standard costing system mentioned that such discounts are automatically taken care of in the setting of the standards at the start of the year, but one firm stated that if further discounts were negotiated, following the setting of the standards, then the standards would not be changed and any difference would go into the variance account.

Commodity Stock Valuation

Five commodities; steel, aluminium, copper, nickel and pig iron were mentioned as being used by some or all of the firms participating. Obviously in the type of manufacturing industry under consider-

ation steel is the most important and most widely used item. Of the commodities mentioned perhaps copper experiences the greatest price fluctuations. Two firms indicated that fixed price contracts were negotiated to cover the supply of copper over a certain period of time but, since no definite question was posed in this respect, it would be unrealistic to conclude that this was the full extent of the use of fixed price contracts for its supply. Firms employing standard costing indicated that the variance accounts would be utilised to incorporate any price fluctuations in whatever direction and irrespective of their frequency. All firms kept individual stock accounts for the commodities from which a stock valuation could be obtained.

Changes in the Method of Stock Valuation

Only 4 of the firms visited reported that their methods of stock valuation had changed over the last five years. Two of these had replaced an actual costing system by a standard costing system in 1971, and this could have caused marked differences in stock valuation figures since changes in standard costs are made only periodically. A further firm mentioned that recently valuation for the year-end was at the new standards for material only, previously the new labour and overhead standard valuations had been incorporated but as this led to anticipating overhead movements the practice ceased. The fourth firm stated that standard costing has proved somewhat inadequate in the face of continued price rises and that a movement back towards actual costing, achieved by reviewing the standards each quarter, was proving more accurate for stock valuation.

Work-in-progress

Valuation of work-in-progress is carried out in an identical manner to that described previously for finished goods. Two firms (8%) out of the 24 did not apportion an overhead valuation to work-in-progress as similarly this was omitted from the finished goods valuation. Excluding these two firms, and one which appropriated overheads to finished goods stock only, the average proportion of overheads incorporated into work-in-progress in the remaining 21 firms was estimated to be 19% (Lowest 2%: Highest 50%). In respect of these percentages it should be remembered that the definition of what constituted work-in-progress could differ between firms, and secondly, in times of spare production, capacity, the overhead content of work-in-progress, could be a larger proportion than at times of full capacity. The one firm which did not apportion overheads to work-in-progress recovered them only through the valuation of finished goods stock at

175% of direct labour.

Each of the firms was asked to indicate if any differences existed between the overheads apportioned to work-in-progress stock and those apportioned to finished goods stock. Despite seven participating firms operating as manufacturing establishments only, one only could not provide an answer. The replies are given below:

| | | |
|---|----|------|
| No difference in application of overheads to finished goods stock and w.i.p.: | 17 | 71% |
| Difference between application of overheads to w.i.p. or finished goods stocks: | 3 | 13% |
| No overheads applied to either w.i.p. or finished goods stock: | 2 | 8% |
| Overheads applied only to finished goods stock: | 1 | 4% |
| Not known: | 1 | 4% |
| | — | — |
| | 24 | 100% |
| | — | — |

The three firms reporting differences between overhead allocations to finished goods and work-in-progress stocks apportioned further overheads to finished goods stock that were *not* included in work-in-progress stock. Such overheads included works administration, obsolete finished stock costs, development expenses, tooling (initial production) costs and redesign reserves.

An average of 9.2% of direct labour was estimated to be contained in work-in-progress for the 21 firms referred to earlier. This figure should, however, be treated with some caution as the labour component will obviously increase as work-in-progress nears the final product state. The figure given is an average and, furthermore, will include the effects of differences in definition by firms of what constitutes work-in-progress. Where firms appropriated all three components to the work-in-progress valuation, 71.8% represented materials, 9.2% labour and 19.0% overheads.

Average time taken for work-in-progress

The nature and production characteristics of the type of industry investigated is indicated by the average figure of 3.7 weeks calculated for the length of time taken for work-in-progress. The bulk of this time is occupied by batch production work necessary in the machine and/or press shops or in the manufacture of sub-assemblies; final assembly work would take only a matter of hours to complete. Variations about this average figure reflected the complexity of the particular consumer durable product being manufactured, the lowest time reported being 2

weeks and the highest 9 weeks. This contrasts sharply with that which may be found in branches of heavy engineering, e.g. machine tools.

Stock appreciation

A basic problem associated with the operation of a standard costing system for stock valuation is that alteration of the standards at annual intervals can mean, in a situation of continued inflation, that a significant appreciation of stock values occurs.

(a) Firms experiencing sudden stock appreciation

It was found that 14 of the 22 firms operating monthly stock value accounts experienced this situation either between the penultimate month of the old financial year and the year-end or between the year-end and the first month of the new year. These 14 firms comprised the 8 which reported including price and wage increases anticipated during the year into the new standards, plus the 6 that operated a standard costing system which, throughout the year, reflected actual prices prevailing *when the standards were set* with no attempt to anticipate any price or wage increases.

Primarily the stock appreciation occurred between the year-end and the first month of the new financial year but, where firms incorporated the new standard costs into the balance sheet valuation, stock appreciation would take place between the penultimate month of the year and the year-end. It should be noted that at year-end there may be a further lack of congruence in the valuations where the balance sheet valuation is different from both the closing stock and opening stock figures in the management accounts.

In the case of one firm stock appreciation took place when the half-yearly accounts were prepared. Additions to and issues from stock only were valued at the new standards until the preparation of the half year's accounts at which point the whole of the stock would be revalued at the new standard costs. The rationale behind this approach was that a proportion only of any likely price increases expected during the year is taken into account when setting the new standards. It attempts to ensure that credit and debit price variance entries balance over the whole year.

Most firms took stock appreciation as meaning the inclusion of anticipated price and wage increases in the new standard costs and only one firm made an estimate of stock appreciation in the sense of the term applied in national income accounting. This firm valued stocks at both the old and new standards at year-end and compared this with a valuation at the old standards at the start of the year. Thus the in-

crease in book value of stock could be split into the value of the physical increase in stock and stock appreciation.

It is obvious that the collection of statistics on stock values is beset with problems in relation to revaluation of stocks at new standard costs. Over half the firms preparing monthly stock valuations experienced this appreciation in value. One possible remedy would be to ask firms supplying stock value statistics to include an opening stock valuation for each month in addition to the normal closing stock valuation. This would be especially important where the standard costs were altered six monthly or annually, for with significant price and wage inflation during these periods, the value of stocks can be significantly increased and estimates of physical changes in stock made all the more difficult. Where firms indicated that only additions to stock were valued at new standards until the next period-end, then it would be necessary for the DTI to request a formal valuation of stock at the start of that period at these new standard costs. However, the evidence suggests that, in the main the entire stock is re-valued overnight at the new standards and thus by obtaining the two figures the value of stock appreciation can be clearly determined.

(b) Firms avoiding sudden stock appreciation

Eight firms (36%) of the 22 preparing month-end stock valuations adjusted the values regularly during the year. Mention was made earlier of one firm that incorporated price variances into the stock valuation and of a further 4 that reviewed standard costs periodically during the year. In particular, 2 of these 4 firms applied an index to material and component stock values, where price increases had exceeded a given percentage in any month. These firms would experience a stock appreciation at the year-end only if the valuation at the new standards significantly exceeded the valuation at the old standard plus index. A further one of the 4 reported a revision of the traditional methods of standard costing in that standards were now reviewed each quarter. This was implemented for the specific purpose of avoiding an enormous stock appreciation between the penultimate set of accounts and the year-end accounts. Following the changed procedure meant that there was little or no stock appreciation between these two points in time.

The fourth firm mentioned that standards for components purchases were altered at the end of each 4-week period if any price rises had occurred, although issues were made at the old standard values until a quarterly appraisal of the finished product cost had been completed. It follows that certain issues

from stock could be at a lower price than the same purchase for a maximum of 2 months after which, because of the stock turnover rate, it is assumed that all components stocks are valued at the new standard prices. This system avoids the stock appreciation problem as certain components would be valued on two different standard costs until (under a FIFO system) all the cheaper items had been issued.

The final constituent group of the 8 firms avoiding the problem of overnight stock appreciation were the 3 firms operating systems of latest actual or progressive average costing. In this, the ideal situation from the point of view of stock appreciation problems, stock values are always up-to-date. However, it is undoubtedly the firm's need for a financial control system, and not the desire to avoid overnight stock appreciation problems that is given greatest weight when deciding which valuation policy to use.

Differences between the standard cost estimate of stocks and the actual cost estimate at year-end

Firms were asked to indicate the extent to which the standard cost estimate of stocks differed from the actual cost estimate. Nine firms out of the 19 that employed standard costing techniques could not give a percentage difference either because they did not utilise an actual cost valuation at year-end and therefore had nothing with which to compare the standard or because the standards were regularly altered during the year and no analysis of the extent of the differences from the actual was made. In both these cases it might be expected that the discrepancy would be negligible. Ten firms provided a percentage figure as requested and for these firms the excess of actual over standard valuations averaged 4%. It should be pointed out, however, that the actual valuation may *not* be an estimate but rather a valuation following a physical stock count, whereas the standard cost valuation will be a book estimate.

Concluding remarks

Because the main investigation required devoting a considerable period for interviewing at each firm it was only possible, in the time available, to cover a relatively small sample of firms. Consequently the results reported here with regard to stock valuation practices, which was a secondary part of the investigation, are statistically insufficient for the purpose of drawing conclusions which could with much validity be said to apply generally within consumer durable manufacturing industry. Despite the above reservation, however, there were areas where broad similarities existed with regard to stock valuation practices and the qualitative results of the report could be of value in outlining the major issues

involved and might provide a basis for a more detailed and wide-ranging investigation into these problems.

In particular, the findings regarding the length of time that stock is held will be of assistance in relation to the revaluation by the DTI of the raw accounting data on stocks supplied by firms. The issues raised by the adoption of standard costing techniques are also of great importance and the practices revealed by this investigation indicate a fairly wide disparity in the exact decision rules that are followed. The section devoted to Stock Appreciation deserves close attention, highlighting as it does a basic problem in the collection of quarterly (or monthly) stock value

statistics, caused by the combination of a rigid costing system (standard costing) and the existence of price inflation. Further work on this problem is necessary.

Acknowledgement. The work reported above was part of a major project concerning inventory decision processes and was financed principally by H.M. Treasury and in part by the Institute of Purchasing and Supply. The authors are grateful for this support which made the investigation possible and also for the generous co-operation by management and staff of the participating firms.

Appendix 1

Valuation practices questionnaire

1. General

- 1.1 (a) Which specific section is responsible for the preparation of regular estimates of stock values and work-in-progress?
 - (b) What records are kept by this section (and in other departments if this is known) of stock holding and stock movements?
- 1.2 (a) Please give a breakdown (split into each broad category) of the total value of stocks as at your last annual stock-take.
 - (b) If your trade is seasonal, does the position of any of these categories change in the hierarchy at any time during the year?
- 1.3 (a) In respect of w.i.p. stockholding, are different categories defined for accounting records?
 - (b) What are the particular categories so defined?
- 1.4 Are particular cost centres in the firm charged interest on the stocks they are holding?
- 1.5 (a) How do you budget stock levels for the year?
 - (b) Do you have a budgeted stock turnover figure(s)?
 - (c) For which categories of stock do you budget a turnover?
- 1.6 (a) What is the average actual length of time you hold (1) raw materials, (2) fuel stocks, (3) principal component parts and (4) finished goods?
 - (b) How do you assess this length of time?

2. Valuation of stocks

- 2.1 (a) How often is a comprehensive valuation made of raw materials, finished goods and fuel stocks?
 - (b) If annually, how do you carry forward your quarterly or monthly estimates?

- 2.2 If a difference exists between the valuation of stock for internal purposes and for the Balance Sheet, what is the nature of the difference?
- 2.3 (a) How are the direct labour costing rates determined for the valuation of w.i.p. and finished goods stocks?
 - (b) What is the average proportion of labour in (i) w.i.p. and (ii) finished goods?
- 2.4 (a) List the overheads apportioned to (i) the various types of w.i.p. and (ii) finished goods.
 - (b) What proportion of (i) w.i.p. and (ii) finished goods valuation is claimed by overheads?
 - (c) What is the difference, if any, of the valuation of finished goods at the depots and in the factory warehouse?
- 2.5 What is the average length of time taken for work-in-progress?
- 2.6 (a) How are materials, fuel and components bought-out 'complete' valued?
 - (b) If any of these items are imported how is the valuation treated?
 - (c) If lower of cost or market value is used, how do you assess 'cost' and 'market value'?
 - (d) When stocks are valued are any trade or cash discounts taken into account?
- 2.7 (a) If a standard cost method is used in valuation, how often is the standard altered?
 - (b) At what specific date(s) in the year is the standard altered?
 - (c) At any point in time, would you have the same physical level of stocks valued on two different standard costs (e.g. at year-end)?
 - (d) On average, how different is the standard cost estimate of stocks from the actual cost estimate of stocks at year-end?
 - (e) Has the standard cost estimate of stocks

- ever been used in the financial accounts?
- 2.8 Has the method of valuation been changed for any of the major stock categories?
- 2.9 Do you make any estimates of stock appreciation?
- 2.10 Are commodity stock figures available?
- 2.11 How is damaged stock valued?
- 2.12 How do you define (i) obsolete and (ii) slow moving stock?
- 2.13 What effect, if any, does the declaration of certain items of stock as obsolete or slow-moving have on their valuation?
Please answer in respect of (i) materials and components; (ii) finished goods?

Appendix 2

Frequency distribution of total number of employees in the factory or division of co-operating firms

| | |
|------------|----|
| Up to 500 | 4 |
| 501-1000 | 7 |
| 1001-1500 | 3 |
| 1501-2000 | 3 |
| 2001-2500 | 1 |
| 2501-3000 | 1 |
| 3001-3500 | 1 |
| 3501-4000 | 2 |
| 4001-4500 | 1 |
| Above 4500 | 2 |
| — | — |
| | 25 |
| — | — |

Appendix 3

Frequency distribution of total stocks held by the factory or division of participating firms as at their last annual stock-take

| | |
|-----------------------|----|
| Up to £500,000 | 3 |
| £500,001-£1,000,000 | 7 |
| £1,000,001-£1,500,000 | 2 |
| £1,500,001-£2,000,000 | 3 |
| £2,000,001-£2,500,000 | 4 |
| £2,500,001-£3,000,000 | 2 |
| £3,000,001-£3,500,000 | 0 |
| £3,500,001-£4,000,000 | 1 |
| £4,000,001-£4,500,000 | 0 |
| Above £4,500,000 | 3 |
| — | — |
| | 25 |
| — | — |

Profit Centres and Transfer Prices — Are they Necessary?

G. M. McNally

Introduction

The existence and growth of large integrated and conglomerate business organisations has resulted in a common phenomenon where the divisions or 'decision centres' of these organisations have substantial levels of interdependency resulting, at least in part, from inter-divisional product transfers and from the existence of resources or facilities which are shared by two or more divisions.

Over the past six or seven decades it has been widely accepted both in academic and professional journals¹ and by practising managers² that profit centres and the pricing of internal product transfers are necessary, and indeed desirable, corollaries of the establishment of divisionalised organisation structures. That is, in business firms having inter-relationships between divisions in the form of product transfers or facilities usage, it is necessary to establish prices for measuring these relationships and it is desirable to incorporate profit centres as elements of the management control system (MCS). However, in recent years there have been proposals³ which suggest that the concepts of profit centres and transfer prices, as traditionally considered, are unsatisfactory and

indeed that incorporating either or both of these concepts into a MCS is undesirable and will serve no useful purpose.

In this article the role of profit centres and transfer prices will be re-examined by asking:

- (i) does a system of profit centres serve any useful purpose in business organisations having closely related divisions?
- (ii) what purposes can be served by transfer prices, with or without an accompanying system of profit centres?

The Concept of Management Control Systems

In attempting to answer the two questions posed above it is important to realise that although a MCS may be interpreted in several forms, including budgets, standard costs, profit centres and transfer prices, all business firms are faced with having to develop and operate a system of management planning and control. Thus an evaluation of the appropriateness of any MCS used in a business firm must be made in relation to alternative systems of management control which could be adopted. For example, would the purposes of a MCS be more efficiently and effectively achieved by using:

- (i) a budgetary control system based on cost centres
- (ii) budgetary control based on profit centres
- (iii) a system emphasising absolute profit levels
- (iv) return on investment as a key criterion
- (v) a system of administered prices within the firm?

The objectives or purposes of utilising a MCS may be identified by considering the following quotations.

"The accountant will wish to judge the impact of various proposals . . . on the information system's ability to perform simultaneously both objectives — the providing of information leading to the optimal allocation of a specific quantity of resources and the generation of complementary information which will be used to control and evaluate the

¹ For example:

— National Association of Accountants, *Accounting for Intra Company Transfers — Research Report No. 30* (New York: National Association of Accountants, 1956).

— Bierman, H., 'Pricing Intra Company Transfers', *Accounting Review* (July 1959), pp. 429-432.

— Dean, J., 'Decentralisation and Intra Company Pricing', *Harvard Business Review* (July-August 1955), pp. 65-74.

— Lemke, K. W., 'In Defence of the Profit Centre Concept', *Abacus* (December 1970), pp. 182-188.

² Empirical evidence is provided in an unpublished thesis by the author, *Decentralised Organisations and some Accounting Problems of Internal Transfers* (University of Canterbury 1970).

³ Goetz, B., 'Transfer Prices: An Exercise in Relevance and Goal Congruence', *Accounting Review* (July 1967), pp. 435-440.

Wells, M. C., 'Profit Centres, Transfer Prices and Mysticism', *Abacus* (December 1968), pp. 174-181.

allocation decision.⁴

'Management control is the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of an organisation's objectives.'⁵

'A management accounting planning and control system should be designed to spur and help executives in searching for and selecting short run and long run goals, formulating plans, appraising performance and pinpointing deviations from plans, investigating reasons for deviations, re-selecting goals, etc.'⁶

From these quotations it is possible to distil some basic objectives of a MCS. These would include:

- assisting in the acquisition and allocation of resources, that is, facilitate the decision-making processes which result in the formulation and implementation of plans;
- providing information on the actual use made of resources, so as to enable evaluation and control to be undertaken;
- ensuring that the persons responsible for allocating and utilising the resources are motivated to act in the interests of the organisational goals.

The Need for Profit Centres

There are a number of difficulties which may arise with the use of profit centres, either in situations of inter-related divisions in business organisations or with more autonomous divisions. In this section the relevant issues to be examined include:

- (i) determination of control and responsibility
- (ii) assisting the motivation of division managers
- (iii) the educative role of profit centres
- (iv) conflicts between divisional and corporate goals.

(a) Establishing Control and Responsibility

One of the requirements which has been established as a prerequisite of an effective MCS is the need to determine areas of responsibility for each 'decision centre'. That is, a manager of a specific activity should have assigned to him responsibility for those items of income, expense and other expenditure over which he can exercise a significant degree of direct control, on the premise that the manager who has the authority to incur is therefore in the best position to control.

The issues which arise are firstly whether the prerequisite referred to above can be achieved in organis-

ations having interdependent divisions and secondly whether in such organisations a system of profit centres will be the most efficient and effective form of management control.

In those organisations where the divisions are substantially autonomous and therefore have only limited degrees of dependency on each other the criterion of 'controllability' may be applied relatively easily as the potential for joint responsibility between divisions is clearly limited. Indeed in such situations it would be possible, at least conceptually, to adopt greater degrees of decentralisation as individual division managers will be able to develop plans and make decisions relating to their divisions, without having to consider the possible impact on other divisions. Within the guidelines provided by central management for desired increases in divisional sales, net profit, production levels, etc., a division manager may act in his own and the firm's best interests synonymously. Although difficulties will arise in determining responsibility for those decision variables over which control is only partially delegated to the division managers⁷ organisations able to achieve considerable divisional autonomy will not have the problems of joint control which beset firms with significant product or facilities interdependencies between divisions.

As a business organisation becomes more integrated it is likely that the degree of divisional autonomy will diminish. The more closely inter-related divisions are within a firm, the less any division manager may act independently and synonymously in his division's and the firm's best interests and thus the spectrum of decision variables for which he may be held individually responsible will diminish. No longer will he be able to control or manipulate a range of decision variables without giving consideration to the possible adverse effect of his actions on other divisions or the overall firm.

Three examples may illustrate the problem:

- (i) If two or more divisions jointly use some productive facilities how will responsibility for maintenance costs, operating costs and material wastages be established?
- (ii) Should a division produce an output which is both transferred to another division and sold to an outside customer, for which customer will the output be designed? If the division receiving the partly processed output must acquire its input

⁴ Dopuch, N. and Drake D., 'Accounting Implications of a Mathematical Programming Approach to the Transfer Price Problem', *Journal of Accounting Research* (Spring 1964), p. 10.

⁵ Anthony, R. N., *Management Accounting Principles* (Homewood: Irwin, 1970), p. 306.

⁶ Horngren, C. T., 'Choosing Accounting Practices for Reporting to Management', *NAA Bulletin* (September 1962), p. 3.

⁷ The delegation of partial responsibility has been used as an argument for restricting the use of profit centres. For examples see Dearden, J., 'Mirage of Profit Decentralisation', *Harvard Business Review* (November-December 1962), pp. 140-154.

Dearden, J., 'Problem in Decentralised Financial Control', *Harvard Business Review* (May-June 1961), pp. 72-80.

from the preceding division which manager is responsible for, and can control, the additional costs incurred to modify the transferred input so that it is compatible with equipment used by the receiving division?

(iii) As the dependencies between divisions increase it is likely that the existence and importance of externalities⁸ will increase, thus complicating the determination of those decision variables which a division manager can control. For example, if a demand relationship exists between the partly processed output which Division A can sell on an external market and the sales of completed output by Division B to external customers then a decision by Division A manager to increase his sales to external customers may reduce the sales of Division B. Any reduction in the earnings of Division B would have been caused by actions substantially outside that division manager's control.

The purpose of citing these examples is to illustrate that determination of control and responsibility for individual division managers becomes more difficult when important dependencies exist between two or more divisions or between an individual division and the overall firm; therefore designing and operating a MCS based on the concept of responsibility accounting will be a more exacting task. If a division manager is to be held accountable only for those decision variables over which he can exercise a significant degree of direct control then the more important the relationships between divisions the smaller the number of variables which may be isolated as being significantly under the control of only one division manager.

If a viable MCS is to be developed and implemented in business organisations having substantial interdependencies between divisions, there may be a need to revise the concept of matching significant or substantial control with responsibility. For no longer will it always be possible to assign each item of income, expense and other expenditure to individual activities. The conceptually ideal situation under responsibility accounting is one which identifies those decision variables a manager controls, and therefore should be responsible for; but this ideal may have to

be compromised to obtain benefits arising from a decentralised system of management. Should such a compromise be unacceptable, a more centralised approach to decision making may have to be adopted with the responsibility of division managers limited to those aspects of their operations which do not involve any important interfaces with another division.

The issue concerning the development and operation of a MCS is whether the traditional view of identifying separate responsibility for items of costs and revenues can be usefully continued in organisations having substantial levels of interdependency and thus joint responsibility. From the discussion above the successful operation of such a concept appears doubtful.

A related issue is whether profit centres or some alternative interpretation of a MCS, such as cost centres, will be more appropriate. Several authors have presented arguments against the application of profit centres on the grounds that in many firms the criteria for using profit centres are not fulfilled;⁹ that is, managers do not have significant control over the decision variables which influence their divisional profit results. Utilising the concept of cost and responsibility centres will provide opportunities for greater flexibility as it is possible to tailor the control system to the specific responsibilities of individual division managers and to the policies adopted for decentralising decision making authority. That is, the reports prepared for division managers may be designed to include only those items of cost which a manager has been delegated the authority to control.

When a system of profit centres is considered there is less opportunity for flexibility as the division managers must have a significant degree of control over both the costs and revenues influencing their divisions. Certainly some flexibility is attainable by using different concepts of profit such as sales margin, controllable profit, contribution margin and net profit; but whenever interdependencies exist problems arise in valuing the partly completed production which is being transferred through several processing centres in order to obtain a 'revenue' figure for calculating divisional profit.

The discussion in this section has suggested that interdependencies will create additional problems in determining the authority and responsibility of individual division managers. To minimise these problems a cost centre concept may seem more appropriate as it offers greater opportunities to design a 'hybrid' MCS suitable for a particular firm.

⁸ This term was used by Whinston, A., 'Price Guides in Decentralised Organisations' appearing in Cooper, W. W., Leavitt, H. J. and Shelley, M. W. (Editors), *New Perspectives in Organisation Research* (New York, John Wiley and Sons, 1964), pp. 405-448. It is intended to refer to those situations where an action by one division will influence the results achieved by other divisions. The nature of the relations between divisions may include nuisance elements created by one division having an impact on another division's operations, or there may be demand or technological relationships between the divisions.

⁹ For example see the proposals of Shillinglaw, G., 'Toward a Theory of Divisional Income Measurement', *Accounting Review* (April 1962), p. 209.

However, the problems attendant upon using profit centres and transfer prices may be accepted after considering fully the roles which both profit centres and transfer prices may serve in an organisation.

(b) *Motivation of Division Managers*

It has been indicated that organisations having substantial inter-relationships amongst divisions will have to resolve the special problems which they face in establishing and operating any system of management control. Particular difficulties will exist when operating a system of profit centres and many firms may attempt to avoid these difficulties by adopting a budgetary control system based on responsibility and cost centres. Before making this decision managers and accountants should consider whether a budgetary system based on responsibility centres and including only controllable expense and revenue items will be a stronger or weaker motivating force for division managers than an alternative form of management control, such as a profit centre system relying either on absolute profit figures or comparisons of actual and budgeted profits.

Lemke¹⁰ observes, when comparing profit and cost centres for motivation, that:

'the motivational advantages of individual profit responsibility by comparison with cost responsibility may be obtained without prejudice to goal congruence.'

Although the author has found a paucity of empirical research evidence to support or refute the hypothesis that profit centres have definite motivational advantages over cost centres, it is reported in Burns¹¹ that:

'It does make a difference to the managers in those divisions as to what you call the centre. We have both quasi-profit centres and true profit centres. The management of the quasi-profit centres insist that they be called profit centres because of the favourable identity that people have with profit centres. These managers, of course, realise that their bottom number is fiction. So you get back to the behavioural aspect.'

If adequate research is undertaken which confirms the motivational advantages of a profit centre concept, a firm will still have to decide whether to structure its system around absolute profit figures for divisional evaluation or whether to use comparisons between budgeted and actual profit results. Difficulties may arise if absolute figures are used as individual divisions

will produce different rates of return and levels of profit. Similarly a division's profit will vary from one accounting period to another. One factor which will contribute to the difficulties of using absolute profit figures will be the prices used for interdivisional transfers of products. If transfer prices other than the prices based on external market prices are adopted, they will produce differences in profit levels as the percentage of output transferred internally changes, thus complicating the evaluation of a division manager's performance. Because equivalent external market prices or adjustments to these prices may be difficult to establish, many firms may consider it more appropriate to rely on comparisons between budgeted and actual profit levels. This procedure would mean that some of the causes of profit distortion may be alleviated as internal and external transactions can be separated and the transfers priced by a convenient method. A division manager would, *ceteris paribus*, achieve his budgeted profit if the proportions of output¹² transferred internally and sold on the external market remained unaltered.

In deciding between a MCS which places emphasis on absolute levels of profit and one which emphasises a comparison between budgeted and actual profit, one factor again to be considered is the relative strength of each approach for favourably motivating managers. Certainly the arguments which occur between managers when establishing transfer prices seem to indicate that they have a strong desire to obtain the highest possible transfer price when they are the selling division and thus to earn the highest possible level of profit.

'Despite years of budgeting indoctrination managers still seem motivated to seek absolute dollar results, comparisons with budget do not have the same psychological force.'¹³

Similarly, Shillinglaw suggests:

'Yet to any observer of transfer price disputes in industry, it is apparent that absolute profit levels are important to managers. They will argue to get a price reduced (or raised if they are on the selling side) with as much vigour as they exert in inter-firm bargaining.'¹⁴

¹² If the budgeted and actual percentage of production transferred internally differ a variance can be derived to explain the difference in sales revenue. Assuming that a flexible budget is used this will be the change in production transferred internally multiplied by the difference between the budgeted market price and the transfer price.

¹³ Davidson, S., *The Budgetary Process and Management Control - Discussion*. Bonini, C. P., Jaedicke, R. K. and Wagner, H. M., *Management Controls: New Directions in Basic Research* (McGraw-Hill, New York, 1964) p. 238.

¹⁴ Shillinglaw, G., *Divisional Performance Review: An Extension of Budgetary Control*, in Bonini, Jaedicke and Wagner, op. cit., p. 162.

¹⁰ Lemke, K. W., 'In Defence of the "Profit Centre" Concept', *Abacus* (December 1970), p. 185.

¹¹ Burns, T. J. (Editor), *The Behavioural Aspects of Accounting Data for Performance Evaluation*, College of Administrative Science, Ohio State University, Columbus, 1970, pp. 159-160.

It would seem that any decision to dismiss the use of profit centres even when divisions are not autonomous can only be made after a careful evaluation of the role that a profit centre concept can have in favourably motivating a division manager. If managers are motivated more by the concept of profit than cost and if absolute profit levels have more significance than comparisons with budgets then profit centres may not represent an undesirable phenomenon. The unfavourable consequence of continuing to use profit centres as the core of the MCS must be weighed against its favourable behavioural implications and the characteristics of alternative systems.

(c) *Educative Role of Profit Centres*

The use of profit centres may be viewed as a means to orient divisional managers towards the same objectives as the overall company, i.e. a concept of profit. Even though profit centres as conventionally used may be considered as sometimes including arbitrary and non-controllable elements, this may not necessarily detract from their usefulness or role as motivators. Divisional managers may, by the use of transfer prices and profit centres, be educated to view the internal prices, which lie partly outside their control, as an external constraint on their operations. This would be no different from the situation which exists at all levels of management whereby it is necessary for managers to operate within environmental constraints. Indeed, it could be argued that if one of the functions of a divisionalised structure and profit centres is to develop the managerial skills of division managers, then difficulties may arise if a business organisation promotes to a more senior position a division manager who has only been responsible and accountable for those aspects of his operations which are substantially under his control. For in a position such as general manager he would be responsible for making decisions which will be influenced by some variables outside his control; however, his experience at divisional level would not have required him to consider fully the impact of the external environment on his actions and performance.

(d) *Conflict Between Divisional and Corporate Goals*

The possibility of conflict between a divisional objective to maximise profit and a profit objective for the overall firm may influence a firm's decision to adopt a MCS utilising profit centres for divisional evaluation. This incompatibility will not normally arise in a business organisation where the divisions are substantially autonomous and do not have significant levels of internal product transfers, as division managers may act in the interests of their divisional profit and the firm's profit simultaneously. Where substantial interdependencies exist there are

two categories of relationships which may result in incompatibility of divisional and corporate objectives.

(i) The demands by divisions for corporate resources or for the products being transferred internally are assumed to be unconstrained by the supply of such resources or products.

(ii) The level of demand by divisions for resources and the internal product exceed the availability of such resources and products so that rationing must occur and some demands remain unsatisfied.

Where no important constraints exist on the corporate resources available to individual divisions and a competitive external market exists for purchasing or selling the intermediate product, the adoption of an appropriate transfer price will not produce conflict between divisional and corporate profit goals and profit centres may be usefully employed. The transfer price to be used must be the external market price for the product, adjusted for cost differences between external and internal transactions, as these prices represent the opportunity costs of the interdivisional transactions. If no competitive external market exists for the intermediate product the supplying division may operate as a monopolist, so that by increasing the price of internal transfers its own profit will increase but to the detriment of the receiving division and the firm as a whole.¹⁵ As the opportunity cost in such a situation is limited to the marginal costs, the supplying division manager will continue to produce units until its marginal cost of production is equal to its marginal revenue. Application of profit centres will be inappropriate for evaluation of division manager performance as without central management direction and control a division manager may act in his division's best interest but to the detriment of the firm as a whole.

An alternative form of management control which relies on cost centres and responsibility centres will enable the operations of individual divisions to be co-ordinated in the best interests of the firm when no external market exists for the transferred product.

When resources are scarce or there are competing demands for the intermediate product it may not be possible to operate a system of profit centres which does not result in conflicts between divisional and corporate goals. What is needed to obtain the best possible results for the overall firm is a centrally derived plan, or guidance which will allocate the resources and intermediate product amongst divisions according to the highest net contribution which is made by each unit of resource to corporate profit. A

¹⁵ For an example of this see Shillinglaw, G., *Divisional Performance: Measurement and Control*, New York, Financial Executives Research Foundation, 1965 (pp. 167-171).

single division manager faced with allocating products and resources amongst multiple demands could not act in his own and the firm's interests simultaneously. As will be discussed in the next section the allocation of scarce resources may be undertaken by using optimally derived 'shadow prices' derived so that a manager may act in the interest of his division whilst still ensuring that the overall best interests of the firm are protected. Division managers would bid for the resources so that in attempting to produce the best result for his division (i.e. to break even) he will be taking actions which result in the most profitable actions for the firm as a whole.

The Role of Transfer Prices

Three related issues will be considered in this section:

- (i) what are the functions or purposes which transfer prices are expected to fulfil?
- (ii) are transfer prices necessary to fulfil these purposes?
- (iii) what alternatives are available to satisfy these purposes without the use of transfer prices?

(i) *The purposes of transfer prices*

Historically the evolution of transfer prices has been associated firstly with the need to obtain an inventory valuation for partly and fully completed production and secondly with a desire to determine the profit results for semi-independent sections of a business firm. Thus suggestions by authors such as Norton, Bliss and later Camman¹⁶ that internal transfers be priced at market prices were to enable individual divisions to have separate profit reports. When considered in this way transfer prices have a 'passive' role, one which they still have in the substantial majority of present day MCS. That is they are considered an essential part of preparing a divisional profit statement, but have a minor role in assisting decision making, other than perhaps to assist in establishing prices and in decisions about the source of purchase for inputs.

In recent years there has been considerable discussion in academic and professional journals that the traditional approach of using a MCS for formulating plans and budgets fails to give explicit recognition or attention to ensuring that resources available to a firm are allocated to divisions in the most efficient way for achieving established objectives. Planning in accordance with accepted concepts of

budgetary control, involving discussion amongst the accountants and managers who will be responsible for the development, implementation and achievement of the budgets, may not result in optimal use of resources. Therefore increasing emphasis is being placed on the planning aspect of management control by the application of formalised planning models which examine the interdependencies between divisions in a more structured manner, to ensure that actions taken by division managers are optimal from the viewpoint of the firm's overall position. Any firm faced with having limited amounts of particular resources may use a formal planning-decision model which could utilise transfer prices in a role of more actively influencing the planning and decisions made by division managers.

(ii) *Are transfer prices necessary?*

If the firm wishes to produce profit reports for divisions, internal product transfers should be priced to establish a 'revenue' element for intermediate divisions which sell part or all of their production to another division. Although it has been argued elsewhere¹⁷ that there is no need to charge division managers for internal transfers, because the managers are generally not responsible for the prices of such transfers, it must be realised that if profit reports are considered desirable; either to establish the investment worth of the division or to evaluate the performance of the division manager, then transfer prices are a necessary corollary. If a firm does not wish to use profit centre evaluation for division managers and is employing the traditionally conceived approach to management planning and control it may not require transfer prices except to obtain an inventory valuation.

Another aspect of whether transfer prices are necessary arises if the organisation wishes to use a formal planning-decision model to determine the allocation of resources amongst divisions, so as to achieve the best possible profit for the firm. It has been discussed elsewhere¹⁸ that the allocation may be made by using transfer prices which reflect the shadow prices for scarce resources. That is, a central planning committee would be established which will collect information about each division's operations and this information will be incorporated into a mathematical programming model to derive the shadow prices. For example, the planning committee would have to acquire from individual division managers, or from a central data bank, information

¹⁶ Norton, G. P., *Textile Manufacturers Bookkeeping* (London 1884)

Bliss, J. H., *Cost Methods in the Packing Industry*, National Association of Cost Accountants (15 April 1922).

Camman, E. A., 'Interdepartmental Profits', *Journal of Accountancy* (July 1929), pp. 37-44.

¹⁷ Wells, M. C., op. cit.

¹⁸ For example Dorfman, R., Samuelson, P. and Solow, R., *Linear Programming and Economic Analysis* (New York: McGraw-Hill, 1958), p. 184.

which included for each type of output:

- costs of input factors
- quantity of each scarce resource required
- selling price
- quantity of each input factor such as direct labour, direct materials and usages of fixed resources including machinery which is required per unit of output.

The shadow prices for scarce resources and the resulting transfer prices for internal product transactions, which are obtained by solving the programming model, provide the basis for the allocation of resources and division managers will be charged for their usages of resources at the shadow prices. However, division managers will have little choice in deciding how they may utilise the resources which they have 'acquired' as the optimal plan producing shadow prices as an end product assumes that actual usage of resources does not vary significantly from desired usage, for if it does an individual division manager will incur a 'loss'.

The approach to using 'shadow prices' which has been outlined will involve a substantial degree of centralisation with the real decision making occurring at the central planning committee. In addition the method requires a large amount of financial and operating information to flow between the divisions and the centralised planning group. An alternative procedure for allocating the scarce resources has been suggested by using the 'decomposition principle'¹⁹. This is intended to reduce the flow of information between divisions and the central planning group and to allow a greater degree of decentralisation to continue, in conjunction with the formal planning model, by instituting a series of information exchanges between the division managers and the central planners which will result in the optimal company wide plan for resource allocation.

Although the detailed operations of this 'principle' are not relevant to this paper a brief summary of its characteristics will place it in perspective. Initially each division manager will formulate a plan for his division by using mathematical programming, without having regard to the possible consequences of his plan on other divisions, or the feasibility of the plan in terms of available corporate resources. Each division will submit to the central planning group a schedule of profit coefficients for each type of output included in its plan. The central planning group will

then solve an 'executive programme' which utilises the information supplied by the divisions and information about corporate-wide constraints, to adjust the divisional profit coefficients for each type of output. That is, the quantity of corporate-wide resource used by a specific type of output is multiplied by the 'dual' price for that corporate resource and the sum deducted from the profit coefficient supplied by the division. These adjusted profit coefficients represent the net worth to the firm of each unit of output in the current solution. Division managers regenerate their plans using the adjusted profit coefficients and re-submit these to the central planning group for inclusion in their executive programme. Iterations will cease when the plans submitted by divisions satisfy the 'executive programme' in terms of an optimal use of the corporate resources.

It has been proposed that the 'decomposition principle' allows an optimal allocation of resources together with a high level of divisional autonomy. However, the central planning group does have the ability to manipulate the plans of divisions by adjusting the profit coefficients for each type of output, thus requiring the formulation of a new optimal divisional plan using these adjusted profit coefficients. Furthermore, the point at which iterations will cease is decided by the central planning group and therefore they will 'determine' the characteristics of the divisional plan to be implemented.

With the use of the decomposition principle and the more 'centralised' allocation method it is important to realise that the allocation of the scarce resources to divisions and the preparation of divisional plans are not activities which can be divorced from each other. Using a decomposition approach does allow the division manager to formulate his own initial plan; however, this plan will be modified by a series of iterations which are 'imposed' on the division managers by the central planning group in an attempt to achieve optimal allocation of the corporate-wide resources. In the alternative approach the central planning group determines the allocation of resources by using the information provided by division managers, thus anticipating the courses of action to be adopted by these managers if the optimal use of resources is to be achieved.

If the system of management control which is used for divisional evaluation should reflect the concepts of decentralised decision making and the principles of responsibility accounting it is doubtful whether these ideas can be successfully incorporated into an operational model for achieving optimal resource allocation. In almost all divisionalised organisations authority will be delegated in varying degrees to division managers to reflect their responsibility over a

¹⁹ For example see Baumol, W. J. and Fabian, T., 'Decomposition Pricing for Decentralisation and External Economics', *Management Science* (September 1964), pp. 1-32.

Hass, J. E., 'Transfer Pricing in a Decentralised Firm', *Management Science* (February 1968), pp. 310-331.

range of decision variables whilst at the same time central management will retain a degree of control over most decision variables. Proposals to adopt models for the optimal allocation of resources to divisions may increase the difficulties of determining the responsibilities of divisional and central managers, as the retention by central management of responsibility for allocating resources would substantially impinge on the division manager's freedom to develop and implement a plan for his division. Although the division managers will develop their initial plans they would have little further part in determining the final plan as the regeneration of plans would be substantially influenced by the central planning committee. Thus a division manager will have his operations constrained within narrowly defined limits and his function may become one of implementing a plan which has been established substantially outside his control.

(iii) *Alternatives to transfer prices*

In the previous section the discussion considered that transfer prices may serve one or more of the purposes of:

- inventory valuation
- evaluation of division manager performance
- guide to decision making and specifically to assist in the allocation of resources to divisions.

What must be reviewed is whether there are alternative procedures available which may enable the above purposes to be achieved without having to overcome the problems associated with establishing transfer prices.

(a) *Inventory valuation*

Although establishing a value for inventory lies outside the domain of management control it represents an important use of transfer prices. If it is considered that inventory should be reported at the sum of the manufacturing costs incurred at each stage of production then costs must be accumulated and transferred through each processing department to obtain a value for completed and in process inventory. Alternatively, and to avoid this cost accumulation, the intermediate and completed products may be recorded in financial statements at some other valuation basis such as market value, which would be ascertained for equivalent products outside the organisation. In the literature which has considered these issues problems which have been cited include:

- the lack of an equivalent product on the external market. Because many firms make technical modifications to products which are substantially transferred internally, so as to effect economies in manufacturing, and because of unique delivery schedules and the geographic location of internally transferred products, the market price for

similar products may not be appropriate.

- similarly the size of the market outside the firm, compared with the level of internal transfers may be relatively small thus introducing possibilities that the price currently existing would not be relevant if the firm was to trade on the external market.

(b) *Division Manager Evaluation*

The need for transfer prices to satisfy this purpose really revolves around the role of profit centres. If it is accepted that the earlier arguments concerning the educative and motivational roles of profit centres for division managers have validity, or that examining the divisions as investment units requires the use of profit centres, then it is difficult to avoid the establishment of transfer prices if distortion is not to occur to the results reported for divisions.

Should the arguments presented in earlier sections be rejected the reliance on cost centre forms of management control will alleviate the need to establish a set of internal prices for achieving this purpose.

(c) *Resource Allocation Decisions*

The development of formal planning decision making models for achieving the optimal allocation of resources has taken two related but different directions in recent years:

- utilising a set of prices for resources and products to guide the actions of division managers so that decentralisation and optimal allocation are achieved
- the application of a centralised plan to control the actions of division managers and to allocate the scarce resources.

It has been suggested that the use of prices to assist in allocating resources does not require the division managers to be charged for the resources 'acquired', but rather that they be advised of the physical quantities of resources which will be available to them in forthcoming periods. If it is accepted that the purposes of an administered price system include allowing a degree of decentralisation to continue, reducing the flow of information between divisions and the central planning committee, and an optimal allocation of resources and products, then the prices which are derived from the planning model are intended to have an 'active' role in guiding the decisions of division managers. Informing the division managers of only the physical quantities of resources will probably provide insufficient guidance for him to determine how such resources should be used and will give no assurance *per se* that a division manager utilises the resources allocated to him, in conjunction with the resources of his own division, in an optimal manner.

If division managers are charged for their use of scarce resources at the shadow prices established in the formal planning model, the price at which resources are 'sold' to a division manager and the prices at which his units of output are transferred to subsequent divisions, or to external customers, will be established so that only by combining the scarce corporate resources with the resources of his division in the way anticipated when formulating the optimal plan, will it be possible for a division manager to break even or earn a zero 'profit'.²⁰ Motivation to use the resources as anticipated in the plan will come from a desire to avoid earning a 'loss' in his division or to improve on the optimal plan, that is, to earn a 'profit' by more efficient use of resources.

Suggestions that resource allocation procedures require the use of shadow prices, but that there is no need to charge individual division managers for the use of these resources, would seem to misunderstand the potential role of such 'prices', as these prices will assist the division manager in formulating his own plan. Informing a manager of his share of the resources does not necessarily guide him in their best utilisation.

The second approach is to retain the concept of centralised planning and not involve the division managers in a system of quasi-decentralisation which will exist when shadow prices are used to guide allocations. Centralised preparation of the plan would provide as output detailed information indicating how division managers should operate their divisions in a forthcoming period, if a specific objective for the overall firm is to be maximised. Research undertaken by authors such as Ijiri, Levy and Lyon²¹ and Demski²² has been directed towards examining the technical, economic and behavioural variables which affect the operations of the firm in a way which establishes a formal model indicating the structural relationships among sections of the organisation and

between different types of transactions. That is, given constraints which management has established as the maximum and minimum acceptable levels for various resources and given an objective function to attain, the model will provide the optimal set of transactions which should be undertaken in a forthcoming period.²³

This approach does not require the development of prices, but rather informs the division managers of the transactions which they must undertake to conform to the centrally derived optimal plan. The reasons for establishing separate divisions become obscured if division managers merely implement the detailed plans given to them.

An Evaluation

The use of profit centres and transfer prices in the control of divisionalised organisations has been widely accepted, often without question, over recent decades. However, there has been a number of articles, including those by Goetz and Wells, which present a plea either to modify the concept of transfer pricing being used, or to abandon it completely. It would seem likely that some of the impetus for using profit centres and in turn transfer prices within a MCS may have come from the growth in mergers and takeovers which often result in new segments being appended to an existing organisation structure. These new segments, often with their own managerial staff, are frequently retained as semi-autonomous units, i.e. profit centres, and as they were acquired to give the firm benefits from vertical or horizontal integration they create situations requiring the pricing of internal transfers.

Transfer prices in such circumstances must be viewed as having a passive role. That is, the transfer prices were necessary to compute the profits of divisions, and where appropriate delegation of authority had occurred, to assist division managers in deciding whether to purchase inputs from and sell outputs to an external customer or another division.

The issues which have been the concern of this article are

- what are the comparative advantages and disadvantages of using profit centres compared with alternative forms of management control in divisionalised firms having substantial interdependencies?
- what are the purposes of transfer prices, do they

²⁰ This is based on the assumption that a division manager will be charged for the use of scarce resources at their 'shadow prices' and will incur costs in operating his division. The 'price' at which a unit of output is transferred out of a division will reflect the standard costs incurred in producing the unit together with the scarce resources used, valued at their shadow prices. Thus, if a division manager used the scarce resources he acquired, as anticipated in the optimal allocation, he will just recover the charges for the scarce resources and the costs of operating his division in the 'revenue' received by transferring his output to a subsequent division at the established transfer prices.

²¹ Ijiri, Y., Levy, F. and Lyon, R., 'A Linear Programming Model for Budgeting and Financial Planning', *Journal of Accounting Research* (Autumn 1963), pp. 198-212.

²² Demski, J., 'An Accounting System Structured on a Linear Programming Model', *Accounting Review* (October 1967), pp. 701-712.

²³ As an alternative the detailed plan could be developed by using simulation methods. Although this method will generally not provide an optimal solution it should provide a 'satisfactory' solution. For an example of applying simulation in this area see Mattessich, R., *Simulation of the Firm through a Budget Computer Program* (Homewood: Richard Irwin, 1964).

fulfil these purposes and are alternative techniques available which remove the need for transfer prices?

Regarding the first issue it must be remembered that the traditional views of responsibility accounting may not be applicable or operational in organisations having interdependent divisions, as any system of management control will have to overcome the problems of joint responsibility. However, it was suggested that the use of profit centres and transfer prices in these circumstances may have motivational and educative advantages over the use of cost centres based on responsibility concepts. It is acknowledged that empirical evidence to support such a view is lacking; however, there are indications from practising accountants and managers that the use of profit centres, even though 'pseudo' in concept, will be encouraged and accepted by division managers. Further, it has been proposed that the effort division managers employ to achieve high levels of absolute profit may indicate more positive motivational connotations associated with the application of profit centres.

The view was expressed earlier in this article that transfer prices are essential for the computation of divisional profit figures whenever organisations use the more traditional approach to formulating plans and it is considered desirable to use a system of profit centres; as these prices may be used to assist in evaluating the performance of division managers and to assess the economic worth of a division as an investment. However, in recent years increasing effort has been directed towards the development of

corporate-wide planning models, following the realisation that more formalised models were available which could be used to plan and to make decisions concerning the allocation of resources. These models may be used within a framework of centralised control so that division managers will be provided with detailed plans which specify how each type of resource is to be used and the nature of the transactions which must be undertaken to satisfy the optimal plan. Alternatively the firm may attempt to retain a decentralised style of management which will require the use of shadow prices and transfer prices for the resources which are available in limited amounts. These prices will have an 'active' role in the MCS as they will guide the decisions of division managers to acquire and use resources.

Profit centres and transfer prices have been subjected to considerable misuse in decentralised organisations where accountants and managers have often viewed them as a panacea for many of the problems of management control and evaluation. However, any proposal to dismiss their use in favour of an alternative MCS must be viewed with caution. There are difficulties in operating a system of profit centres and transfer prices. However, in this article it has been suggested that even with their deficiencies profit centres may have an important role in motivating division managers; a role which may not be satisfied by a system of responsibility budgets and cost centres. Further, it has been demonstrated that if a formal model of corporate planning and decision making is being used, transfer prices may have an integral part in formulating the plans both for divisions and the over-all firm.

Shareholder Behaviour attendant upon Capitalisation Issues

Michael Firth

An important and maybe overriding goal of a company is shareholder satisfaction. It is surprising, therefore, that so little research attention has been given to ascertaining what shareholders' preferences are.¹ Textbooks usually assume that the maximisation of share values (via maximisation of net present value of the firm) will suffice – however, most experts would acknowledge that other objectives are also sought by investors.

Probably the first serious attempt to measure investor preferences is being made by Professor Briston, who is investigating shareholder behaviour in the new issue market. Preliminary reports of the research have suggested that useful information can be obtained from basic analyses of shareholder turnover (5), (6).*

The objective of this paper is to present information on the impact of capitalisation issues on shareholder behaviour and to measure the subsequent effects. Analyses will be made which will ascertain the effect of scrip issues on the marketability of stock; specifically this will involve an examination of shareholder numbers and of share turnover.

The normative goal of a business is usually held to be maximisation of shareholder wealth subject to certain behavioural constraints. Shareholder wealth is principally evidenced by share values and the present investigation will look at the implications for share prices of shareholder behaviour attendant upon a capitalisation issue. This will provide some criteria for the making of scrip issues.

Capitalisation issues

A capitalisation issue involves the capitalising of reserves into new shares which are distributed *pro*

rata to shareholders; no new money accrues to the company and the firm's earning potential is unaltered. The accounting treatment of capitalisation issues basically entails debiting a company's reserves and crediting the share capital account with the nominal value of the newly created shares. Total shareholders' funds remain the same but with more shares in existence the asset value will reduce proportionately. The company's earnings and dividend paying potential is unaltered and so the market capitalisation should, *ceteris paribus*, remain the same and the share value will reduce accordingly. The main effects of the issue are to reclassify shareholders' funds, increase the number of shares in issue and to reduce the share price.

Share splits involve reducing the nominal value of the shares in issue and increasing the number of shares in existence so as to maintain the Issued Share Capital. Splits do not involve a capitalisation of reserves so the classification of equity funds between Capital and Reserves remains the same. The company's worth, as expressed in earnings and dividend potential, is not altered as the share price will adjust, *ceteris paribus*, proportionately.

In the United States the accounting profession differentiates between what are termed stock dividends and stock splits. Basically a stock dividend requires capitalisation of reserves (at an amount equal to the market value, not the nominal value (16)), whereas a stock split involves a reduction in par or stated value. From the New York Stock Exchange rules and the American Institute of Certified Public Accountants' recommendations it is the accepted case that any stock distribution of 24 per cent or less is a stock dividend and therefore requires capitalisation of reserves and any distribution greater than 24 per cent is a stock split. Such an arbitrary ruling was based on an investigation of market action (1). Although this rule has been criticised many times² it is still the accepted practice.³ In the UK there are

¹ For examples of work that has been done in this field see Clendenin (11) and (12) and Briston (7). Research has probably been held back by the expense of obtaining information and because of difficulties in measuring the data.

*Figures in brackets refer to works cited at the end of this article, on page 32.

² See references (9), (3), (8).

³ See references (2), (8).

no restrictions on share splits or capitalisation issues (as long as there are sufficient available reserves to be capitalised).

Traditional views of the effects of capitalisation issues

In view of the normative effects of capitalisation issues one would not expect them to be very popular; however, during the ten year period from January 1962 to December 1971, 3,277 issues were made. Thus scrip issues are frequently used and this would suggest that advantages may accrue and that these could be realised in terms of share price performance. Several authors have in fact advocated a policy of making regular scrip issues.⁴

One of the prime reasons given for making capitalisation issues is that they reputedly increase the marketability of a company's shares and it is to this aspect which the present research addresses itself. An increase in marketability, which may be defined broadly as the ease with which a particular security can be traded, may help achieve the goal of share value maximisation in the following ways: (a) more investors may be attracted to the stock as they realise they can buy and, more importantly, sell, at some price, at any time. Such investor demand could increase the share price, a gain which may be kept over a long period; (b) if an individual's holdings are proportionately reduced, because of the ease of dealing, then there is less likelihood of any one particular holder upsetting the market by a sale of his holding. Most commentators would agree that an increase in marketability is desirable for many smallish companies but there are doubts about the advantages for large firms.

Increasing the marketability of a stock may be achieved by (i) increasing the number of investors on the share register by some method, (ii) reducing 'high' share prices to a level where more investors are prepared to trade (on the basis that many individuals would balk at the idea of paying, say, £10 for a share as a round lot of 100 shares would involve an outlay of £1,000). Obviously the major influences on marketability would be the fundamental factors of profitability and stability of the company but the above processes can be achieved by a scrip issue which is a mere book-keeping transaction. Thus a major factor in improving marketability may be to increase the number of shareholders.

Capitalisation issues may lead to an increase in shareholder numbers as (a) they reduce share prices, (b) by allotting a new tranche of share certificates, investors may find it convenient to sell a portion of

their holding, (c) it may make investors aware of their holdings, (d) no stamp duty is payable within the renunciation period and so sales may be encouraged.

No research has been undertaken in the UK on the effects on capitalisation issues on shareholder numbers and the American studies are somewhat scarce. The US research has looked at the percentage shareholder change in the years after a split and the results have been classified by the scrip terms, share price levels and by dividend performance. It was against this background that the current research was undertaken.

Prior research

The first study into the effects of stock distributions on shareholder turnover was undertaken by Dolley, the results of which were published in the *Harvard Business Review* (13). The periods he looked at varied from about six months prior to the issue to six months after. He found that trading increased significantly around the split-date, 'apparently a split-up provides an immediate, though temporary, stimulus to trading'. As may have been expected Dolley found that the larger split ratios and the higher priced securities gained the greatest number of shareholders. He concluded 'Clearly, it must be concluded that stock splitting tends definitely toward a wider distribution of corporate ownership. Whether this effect results from the absolute increase in the number of shares outstanding, or from the increased marketability of the stock, it is impossible to say; undoubtedly both factors play some part'. Dolley's findings related to the 1920s but the impact of splits on the numbers of shareholders then seems much the same as the results of more recent studies.

Barker made a study of shareholder behaviour around the date of stock dividends and splits during the years 1951 to 1953 (4). He compared the findings against a control group of non-splitting companies and classified the results by whether the accompanying cash dividend was increased or not. Barker found that companies making stock splits and stock dividends showed a significantly greater than average increase in the number of shareholders over the three year period 1951-1953. Whilst those distributions accompanied by cash dividend increases experienced the greatest growth, the no increase cash dividend splits still showed a considerable rise over the control group. Like Dolley he found the greater the percentage distribution the greater the increase in shareholder numbers, although as Barker pointed out the smaller distributions are often more frequent.

Bernard Graham conducted an investigation into the effects of stock splits on shareholder numbers and on stock prices (14) and (15). His population consisted of companies quoted on the New York

⁴ See Clarkson and Elliott (10) and Samuels and Wilkes (17).

Stock Exchange who made splits of 1 for 1 or 2 for 1 during the five years 1959-1963. He extracted the shareholder numbers at the end of each year (up to three years after the issue) and compared the results against a control group which did not make a distribution. The results confirmed the earlier findings of Dolley and Barker.

Graham then went on to look at the impact of the increases in shareholder numbers on stock prices. His hypothesis was that companies gaining the greatest number of shareholders would enjoy the best share price performance. Surprisingly this did not prove to be the case. The aggregate share price performances, whilst having short-term increases, did not out-perform the market average. Graham concluded that while splits had a positive effect on the number of shareholders this did not lead to a significant increase in market value and thus that many of the splits made during 1959-1963 were not warranted and were issued by management without any thought on the implications: 'Sheer numbers of stockholders owning comparatively small amounts of stock do not constitute a desirable objective *per se*'.

The studies have been unanimous in finding that stock splits and stock dividends lead to a greater than average increase in the number of shareholders and Barker's study indicated that this was the case no matter what the dividend performance. Only Graham looked at the association between shareholder numbers and stock prices but his findings are no comfort to the protagonists of free stock distributions.

Shareholder investigation — methodology and population

The investigation consisted of obtaining the numbers of shareholders registered with 70 companies making scrip issues throughout the three years 1968, 1969, and 1970 (representing about 9 per cent of the total population of 753 made during the period). The population of 70 represented those companies that, through their share registrars, were willing to co-operate. In fact the companies tended to be representative of the population as a whole and the conclusions drawn from the sample are felt to be indicative of the total number of 753 scrips. None of the sample made more than one issue and none were involved with mergers or takeovers. Thus the sample served as an adequate data base for making conclusions and recommendations about the effects of scrip issues on improving marketability and the impact of marketability on share prices.

The data were collected from share registers of the various companies. The dates on which information was extracted were (a) the date just prior to the ex-scrip date. This tended to vary from the exact day

before the issue date to periods up to a month earlier. The reason for such discrepancies, was usually administrative in that companies often only recorded new shareholders once a fortnight or over some longer period. (b) a date six months after the issue. Again the exact date varied usually by a week or so. Information extracted at this date gave the first evidence of shareholder change after the ex-scrip date. (c) a date one year after the issue which gave the longer term effects of having a lower share price and of having more shares in existence. (d) a date two years after the issue, and (e) a date three years after the issue. Both these later dates were useful in appraising the longer term effects of the issue. Obviously looking so far ahead after the issue incorporates many other events which may affect shareholder numbers but nevertheless the figure is significant when compared against the control group and provides a comparison against studies done in the USA which tended to look at the longer time periods.

Certain other dates had to be neglected because of the lack of resources available. Principally the shareholder reaction around the announcement day was omitted. As dividend and earnings announcements were invariably reported at the same time as news of the scrip was released any analysis of shareholdings at this date would reflect both sets of information. It was felt that to assess shareholdings at the date of announcement would not be fruitful — the major impact of the new shares coming on to the market would, after all, occur just after the ex-scrip date. Another recording date that was omitted was a date just after the ex-scrip date (say one or two months after) but because of the varying practices of delaying registering new shareholders it was felt that the results would have been biased and inconsistent. By using a date six months after the issue, all the initial shareholder changes would have been recorded and other factors would be kept to a minimum. Unfortunately, access to some of the share registers was limited and so data for some periods were not available (the exact make-up will be given later in the detailed analyses).

The data consisted of the total number of shareholders registered with the sample of companies. This information was transformed into percentage changes from the base date which was the recording prior to going ex-scrip. In order to assess the results it was necessary to construct a control group. This was made up of 30 companies which did not capitalise their reserves or make share splits during the three years to December 1970. Recordings of shareholdings on an annual basis were made so as to obtain the annual percentage change in holdings and it was these

figures that were used for comparison purposes.

As shareholdings can be affected by variables other than scrip issues it was felt necessary to classify the results by various financial characteristics. The specific factors looked at were dividends and earnings performance, terms of the issue, the market capitalisation of the company and the advising financial institutions.

Shareholder investigation — findings shareholder turnover

Table 1 shows the frequency of percentage increases in the number of shareholders of the 70 companies in the sample. There is a noticeable increase in all four periods and with a widening dispersion. The table also gives the mean average increase in shareholdings over the various dates and these can be compared against the control group. There is a clear lead in the increase in shareholdings for companies who made capitalisation issues and this was evidenced by the first six months after the issue. Thereafter the increases were kept but only at the same absolute

level. Thus the analysis indicates that there is a positive increase in the number of shareholdings of a 'scripping' company, and that this accrues in the first six months after issue. There are very few cases of shareholder decreases and these are probably due to adverse financial results and so scrip issues appear to be an effective financial tool in increasing the number of shareholders.

Table 2 shows the degree of association between the increase in shareholdings at the various dates used for the recordings. There is a high correlation between dates 1 and 2 and a reasonable correlation between dates 2 and 3. This degree of association would be expected as most of the increase came in the first six months (companies having a large increase at date 1 are likely to have maintained the increase at date 2). There is a reasonable level of correlation between dates 1 and 3 and between 3 and 4. It is apparent that the further away a recording is taken the poorer the correlation (which is as expected).

There are quite a few factors which may affect the number of investors in a company apart from a

TABLE 1

Changes in the number of shareholders of companies making capitalisation issues in the years 1968, 1969 and 1970

| % Change | Frequency | | | | | | | |
|------------------|-------------|-----|--------|-----|---------|-----|---------|-----|
| | 6 Months | | 1 Year | | 2 Years | | 3 Years | |
| | 1 | | 2 | | 3 | | 4 | |
| | AFTER ISSUE | | | | | | | |
| | % | | % | | % | | % | |
| -100 to -51 | 0 | | 0 | | 0 | | 0 | |
| -50 to -26 | 0 | | 0 | | 1 | 2 | 0 | |
| -25 to -21 | 0 | | 0 | | 0 | | 0 | |
| -20 to -16 | 0 | | 0 | | 0 | | 0 | |
| -15 to -11 | 0 | | 1 | 1 | 0 | | 1 | 4 |
| -10 to -6 | 1 | 1 | 0 | | 3 | 6 | 1 | 4 |
| -5 to -1 | 3 | 4 | 8 | 11 | 2 | 4 | 0 | |
| 0 | 4 | 6 | 4 | 6 | 3 | 6 | 2 | 9 |
| 1 to 5 | 22 | 33 | 17 | 26 | 5 | 10 | 1 | 4 |
| 6 to 10 | 14 | 20 | 13 | 19 | 11 | 23 | 4 | 18 |
| 11 to 15 | 9 | 13 | 6 | 8 | 3 | 6 | 0 | |
| 16 to 20 | 6 | 8 | 4 | 6 | 2 | 4 | 2 | 9 |
| 21 to 25 | 4 | 6 | 8 | 11 | 2 | 4 | 0 | |
| 26 to 50 | 6 | 8 | 3 | 4 | 9 | 19 | 7 | 30 |
| 51 to 100 | 1 | 1 | 5 | 7 | 4 | 8 | 2 | 9 |
| >100 | 0 | | 1 | 1 | 4 | 8 | 3 | 13 |
| | | 100 | | 100 | | 100 | | 100 |
| No recording | 0 | | 0 | | 21 | | 47 | |
| | 70 | | 70 | | 70 | | 70 | |
| Mean | | 10 | | 12 | | 15 | | 18 |
| Control Group | | | | | | | | |
| Average % change | | | | 4 | | 7 | | 11 |

TABLE 2
Comparison of changes in shareholdings at different dates

| % Change in Shareholdings | Percentage change in Shareholdings | | | |
|------------------------------|------------------------------------|--------|--------|--------|
| | Date 1 | Date 2 | Date 3 | Date 4 |
| Date 1 r | 1.0000 | 0.8583 | 0.4920 | 0.1844 |
| x^2 | | 82.72+ | 50.62+ | 11.62 |
| Date 2 r | 0.8583 | 1.0000 | 0.4140 | 0.2183 |
| x^2 | 82.72+ | | 49.79+ | 15.67 |
| Date 3 r | 0.4920 | 0.4140 | 1.0000 | 0.5278 |
| x^2 | 50.62+ | 49.79+ | | 54.93+ |
| Date 4 r | 0.1844 | 0.2183 | 0.5278 | 1.0000 |
| x^2 | 11.62 | 15.67 | 54.93+ | |

r = Correlation coefficient

x^2 = Chi-square

* = Statistically significant correlation coefficient

+ = Significant chi-square score at the 0.05 level

Date 1 = 6 Months after the scrip issue

Date 2 = 1 Year after the scrip issue

Date 3 = 2 Years after the scrip issue

Date 4 = 3 Years after the scrip issue

capitalisation and Table 1 does not incorporate such other variables. Principally, the dividend and earnings performances may be expected to increase investor activity and shareholder numbers. In order to assess the significance of financial performance tables of dividends and earnings both at the time of the issue and at a date one year later were compared against the percentage change in shareholdings.

Table 3 shows the performance of dividends announced at the date of issue against the percentage change in the number of shareholdings one year after the scrip. The table reveals a degree of positive association between the two variables. The correlation coefficient was 0.4031 which was statistically significant.⁵ Tables were compiled for dividend performance against shareholder numbers at other dates. A significant correlation was found at the date six months after the issue ($r = 0.4365$) but the other associations were weak ($r = 0.2738$ at date 3 and 0.0970 at date 4). Thus dividend performance at the date of issue was positively correlated with the increases in shareholdings experienced in the first year after scrip.

Similar analyses were carried out on the correlations between earnings performances at the announcement date and the number of investors. Table 4 shows the relationship between earnings and the increase in shareholdings after one year. The correlation coefficient was 0.4263 which is statistically significant. Coefficients were also computed for other dates ($r = 0.4776$ at date 1, $r = 0.3046$ at date 3, $r = 0.2710$

at date 4). The coefficients were in all cases higher than those for dividends on comparable dates. This is probably due to dividends being less volatile, as they are a managerial decision. The results for earnings are much the same as those for dividends given in the previous paragraphs, i.e. earnings published at the date of announcement of a scrip are positively and significantly correlated with increases in the number of shareholders in the year after issue.

The results from Tables 3 and 4 indicate that dividends and earnings announced at the time of a scrip issue may affect the number of investors in a company and that it may be these two variables which account for the complete change in shareholdings shown in Table 1 and thus that the capitalisation had no effect. In order to assess the significance of this, analyses were prepared to show the relationship between the dividend and earnings performances one year after issue and the increase in shareholdings straddling the announcement of such. This measured the degree of association between financial performance and shareholdings, away from the influence of a capitalisation issue. No significant correlations were found in the data. The analyses showed that dividend and earnings performances one year after the issue, by themselves, do not lead to any significant change in the number of shareholdings in a company. Therefore the significant results from Table 1 can be attributed to capitalisation issues and from Tables 3 and 4 any dividend and earnings increase at the date of the issue will enhance the shareholder number gains. Thus scrip issues appear to be a fairly reliable method of increasing the number of investors in a

⁵ Using the 't' test.

TABLE 3
Comparison of the changes in the number of shareholdings at Date 2 against dividend performance announced at date of issue

| Shareholder % change | No Recording | % Dividend Change | | | | | | | | | | | | | |
|----------------------|-----------------|-------------------|------------------|------------------|------------------|-----------------|---------------|----|--------------|---------------|----------------|----------------|----------------|-----------------|------|
| | | -51 to -100 | -31 to -50 | -21 to -30 | -11 to -20 | -6 to -10 | 1 to -5 | 0 | 1 to 5 | 6 to 10 | 11 to 20 | 21 to 30 | 31 to 50 | 51 to 100 | >100 |
| -15 to -11 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| -10 to -6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -5 to -1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 1 | 0 | 1 | 0 | 8 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 4 |
| 1 to 5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 4 | 0 | 2 | 2 | 1 | 0 | 17 |
| 6 to 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 2 | 4 | 0 | 0 | 0 | 13 |
| 11 to 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 6 |
| 16 to 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 4 |
| 21 to 25 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 8 |
| 26 to 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 3 |
| 51 to 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 5 |
| > 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| | 4 | 0 | 1 | 0 | 0 | 0 | 1 | 20 | 14 | 8 | 8 | 6 | 5 | 2 | 70 |

Correlation coefficient = 0.4031 $\chi^2 = 62.8$ with 42 degrees of freedom Significant at the 0.05 level.

TABLE 4
Comparison of the changes in the number of shareholders at Date 2 against earnings performance announced at date of issue

| Shareholder % Change | No Recording | % Earnings Change | | | | | | | | | | | | 51 to 100 | >100 |
|----------------------|-----------------|-------------------|------------------|------------------|------------------|-----------------|----------------|---|--------------|---------------|----------------|----------------|----------------|-----------------|------|
| | | -51 to -100 | -31 to -50 | -21 to -30 | -11 to -20 | -6 to -10 | -1 to -5 | 0 | 1 to 5 | 6 to 10 | 11 to 20 | 21 to 30 | 31 to 50 | | |
| -15 to -11 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| -10 to -6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -5 to -1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 8 |
| 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 4 |
| 1 to 5 | 0 | 1 | 1 | 2 | 2 | 0 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 0 | 17 |
| 6 to 10 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 3 | 1 | 4 | 0 | 1 | 0 | 13 |
| 11 to 15 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 6 |
| 16 to 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 4 |
| 21 to 25 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 8 |
| 26 to 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 3 |
| 51 to 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 5 |
| >100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 4 | | 1 | 2 | 3 | 3 | 6 | 3 | 4 | 8 | 7 | 12 | 6 | 4 | 3 | 70 |

Correlation coefficient = 0.4263 $\chi^2 = 81.9$ with 63 degrees of freedom Significant at the 0.05 level

company.

The foregoing analyses established that capitalisation issues lead to an increase in the number of shareholders and it is now proposed to assess how the percentage increases can be maximised. One obvious analysis is to compare the terms of an issue against shareholder increases. It is hypothesised that the greater terms will be associated with a greater increase in investors as more shares are created. This postulation is backed up by Graham's findings which were reviewed earlier.

Table 5 shows the relationship between the type of terms and the increase in shareholdings at date 2. Surprisingly there was very little correlation and the chi-square score was insignificant. Statistical tests were carried out on the data at other dates but, again, the results were not significant. Thus the terms associated with an issue do not appear to affect the rate of increase in the number of shareholders. This finding goes against Graham's work and against intuitive reasoning – that a larger percentage increase accrues to higher terms.

Tests were carried out on the size of the organisation as compared against shareholder increase; no significant relationships could be established. Both Graham and Dolley found that companies with the

smallest number of investors prior to a scrip recorded the largest percentage gains. Similar analyses on the present data found only a very weak relationship which was surprising in view of the American research. Further tests were carried out comparing financial advisers but none of the correlations were significant. (This analysis was carried out to see if any one financial adviser was related to a specific performance.)

Capitalisation issues usually lead to a bigger than average increase in the number of shareholdings and good dividend and earning figures announced at the time of the issue enhance the gains. No other variable which was measured seemed to have any effect on the degree of the increase, and therefore no guidance can be given on how to optimise the number of investors (apart from making an issue when reporting good results).

Findings – effects on share prices

Given that an increase in the number of shareholders takes place it is then necessary to see if any advantages accrue. The only practical measurement is to use share prices and so analyses were developed measuring price performance against the number of shareholders. Share prices were collected at the

TABLE 5

Comparison of changes in the number of shareholdings at Date 2 against scrip terms

| | % Shareholder Change | | | | | | | | | | | |
|--------------|----------------------|-----------------|----------------|---|--------------|---------------|----------------|----------------|----------------|----------------|-----------------|------|
| Terms | -15 to -11 | -10 to -6 | -5 to -1 | 0 | 1 to 5 | 6 to 10 | 11 to 15 | 16 to 20 | 21 to 25 | 26 to 50 | 51 to 100 | >100 |
| 1 for 1 | 1 | | | | 7 | 2 | 2 | | 2 | | 2 | 16 |
| 1 for 2 | | | 2 | 1 | 3 | 2 | 1 | | 2 | | | 11 |
| 1 for 3 | | | 1 | | 1 | 4 | | | 1 | | | 7 |
| 1 for 4 | | | | | | | | 3 | 2 | 1 | 1 | 7 |
| 1 for 5 | | | 1 | 1 | 3 | | | | 1 | 1 | | 7 |
| 1 for 10 | | | 2 | 1 | | 2 | 1 | 1 | | | 2 | 9 |
| 2 for 1 | | | | | | | | | | | | 1 |
| >2 for 1 | | | | | 1 | 2 | 2 | | | 1 | | 6 |
| 1 for 20–50 | | | 1 | | | | | | | | | 1 |
| 1 for 51–100 | | | | | 1 | | | | | | | 1 |
| 1 for 1 odd | | | 1 | 1 | 1 | 1 | 1 | | | | | 4 |
| | 1 | 0 | 8 | 4 | 17 | 13 | 6 | 4 | 8 | 3 | 5 | 70 |

Correlation Coefficient -0.0780

$\chi^2 = 22.1$ with 49 degrees of freedom

Not significant at 0.05 level

TABLE 6

Comparison of changes in shareholdings against share price performance

| % Change in Shareholdings | Share Price Performance | | |
|------------------------------|---------------------------------|----------------------------------|-----------------------------------|
| | Date 6 (1 month after issue) | Date 7 (6 months after issue) | Date 8 (12 months after issue) |
| Date 1 r | 0.1843 | 0.2890* | 0.3437* |
| x^2 | 9.01 | 25.01 | 36.10+ |
| Date 2 r | 0.1910 | 0.3302* | 0.3787* |
| x^2 | 7.41 | 31.62 | 37.84+ |
| Date 3 r | 0.0883 | 0.1380 | 0.1680 |
| x^2 | 2.16 | 7.97 | 8.12 |
| Date 4 r | -0.0280 | 0.0371 | 0.0475 |
| x^2 | 1.01 | 1.05 | 2.05 |

* = Statistically significant correlation coefficient

+ = Significant chi-square score at the 0.05 level

 r = Correlation coefficient x^2 = Chi-square

following intervals: the ex-scrip date, one month after going ex-scrip, six months after ex-scrip, and one year after ex-scrip. The share prices were then adjusted by the industry index movement (the *Financial Times* - Actuaries industrial sub-indices were used) and measured against the first ex-scrip date price recording. Table 6 shows the correlations and chi-square values for the various shareholder increases against the various share price relatives. As can be seen, the initial increase in the number of shares does little to the share price one month after the issue - there is some degree of association, but it is very slight. The share price relative six months after the issue does have a statistically significant correlation with the number of shareholders at date 1 and date 2. Share price relatives one year after the issue are significantly correlated with the shareholder increases at dates 1 and 2. Shareholder increases at dates 3 and 4 are very weakly correlated with share price relatives up to one year after the issue, which is as expected.

Summarising the results it can be said that companies making capitalisation issues will tend to receive a significantly increased number of shareholders and the figure is likely to be greater if the dividend and earnings performances are good. Apart from the financial results of the company there appears to be no way of determining whether a company will have a large, medium or small increase (i.e. terms, and the initial pre-scrip numbers of investors have no effect). There is a weak though significant tendency for higher levels of shareholder increases in the year after issue to be associated with

better than average share price performance. However, such superior share price performances are likely to be attached to those issues where an increase in dividend and earnings has been made.⁶

Findings - share dealing activity

Because of the time and costs involved no analysis on share turnover around the scrip date could be undertaken. However, an analysis was made of the bargains recorded around the ex-scrip date and this gives some indication as to the share activity. The bargains record the various prices at which deals were done on the London Stock Exchange - no indication is given, however, of whether the bargain represents a sale or a purchase. Only one bargain at each price is recorded, i.e. if a stock has 20 dealings in it at a sale price of 30p, then only one bargain is recorded. Stock Exchange members do not have to mark bargains except in special cases, and the list cannot, therefore, be regarded as a complete record of prices at which business was done. A bargain is made for a specific price with no regard to the number of shares involved - one bargain may represent a transaction to the value of £100, another in the same stock may represent £250,000. Nevertheless, the recordings do give the best indication available of the activity of dealings in a particular stock and are

⁶ Correlation analyses showed there to be a positive relationship between share price increases and dividend and earnings performance.

frequently quoted as such in the Financial Press. (The *Financial Times* gives a table listing the most active stocks each day. This list is compiled from the number of bargains reproduced in the Official List.)

The analysis consisted of extracting the number of bargains recorded in the Official List for each day from a base point ten days prior to the ex-scrip date to a date ten days after. This analysis was carried out on a sample of 100 stocks which made issues in the period 1968 to 1970. From the data obtained daily averages were obtained for the ten day period prior to the scrip date and an average computed for the ten days after. The aggregate average prior to the issue was compared against the aggregate average after that date. The percentage increase in bargains recorded came to 24 per cent, which is a substantial rise (the sample was equally spaced in the bull, bear and static market conditions). The lowest gain recorded was 1.2 per cent, but this represented (a) very small scrip terms, (b) a very small company. The highest gain was 65 per cent but this represented a small company which did not have bargains on many of the days in the ten day periods.

Overall the companies experienced a significant increase in the number of bargains recorded after a scrip issue had been made. Bearing in mind what is entailed in marking bargains the results could be interpreted as indicating that there is an increase in shareholder activity in the ten days after the ex-scrip date. In an investigation of the following ten day period (i.e. up to 20 days after the issue) it was noticed that the number of bargains were slipping back to former levels. This finding is pretty much the same as the conclusion arrived at by Dolley, i.e. that share turnover is increased immediately after a scrip issue and is consistent with the increases in shareholdings recorded after an issue.

Summary

The analyses show that a significantly above average increase in shareholder numbers is achieved from a scrip issue and this is emphasised when good financial results are announced at the same time. Based on the number of bargains recorded, investor activity rises

sharply after the issue of the scrip shares. Thus a company wanting to increase its number of shareholders would find a capitalisation issue a valid, applicable technique. However, such an increase in investors will probably result in a better than average share price performance only if a dividend or earnings increase is recorded. The research has not shown any share price benefits resulting from scrip issues and thus the desideratum of capitalisation issues may be spurious.

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Asset Valuations before and after Liquidation

D. A. R. Forrester

Introduction

'The accounting profession was born through bankruptcies, fed on failures and frauds, and grew on liquidations, and graduated through audits.'¹ This remark was made by J. C. Bonbright, whose chief contribution to our subject was a study, in 1937, of indemnity values, by which an owner would be exactly compensated for loss of an asset. Since that time, rapid inflation has stimulated much advocacy of replacement price valuations. But increasingly clearly in this country have been heard the arguments of Professor R. J. Chambers of Sydney, in favour of realisable values. As test of the feasibility and objectivity of Chambers' proposals, we now report on an examination of liquidating firms, comparing their balance sheet values, produced according to generally accepted accounting principles, with the subsequent Statement of Affairs valuations and actual realisations.² We therefore now put to the test beliefs, such as those of the Cohen Company Law Amendment Committee, that the value to a going concern, for fixed assets at least, 'will bear no relation to their value if the undertaking fails'.³

Our study is of relevance not only to outside users of financial reports. Management should frequently assess the market values for most of their assets. H. H. Schofield's study of the replacement of equipment⁴ in twenty firms revealed that all these firms considered using second-hand equipment, at least under certain circumstances, and that 40 per cent could sell on a second-hand market. But prices in such markets are not as readily established as those for new equipment. Our study was therefore concerned with the feasibility and objectivity of market valuations. It can be complemented by D. L. McDonald's examination of the feasibility of market-based measures, which found that sample estimates

of market values for motor vehicles were less disperse than book valuations;⁵ and by Sterling and Radosevich's valuation experiment for a typical desk-top calculator – in this case the book values established by a sample of accountants had lower variance than their estimates of current market prices.⁶ In most cases, accountants would claim no expertise in assessing market prices: in our cases, the liquidators were free to call in qualified valuers.

The Going Concern Convention

Despite wide and implicit acceptance in financial reporting, the Going Concern convention has been examined critically by several academics recently. S. C. Yu concluded that it was a total concept, and that valuations of assets and asset-classes were a matter of expedience until a better convention could be evolved.⁷ Fremgen was more critical, particularly of assuming what company mortality statistics make tenuous, and of trying to base other conventions on it.⁸ Sterling similarly criticised the necessity of its connection with historical cost valuations.⁹ Valuations of the whole and of components are indeterminant, he said, as long as the going concern convention is true. If the true income of the firm can be calculated only when it is wound up, and if accounting aims to measure true income, then the liquidated firm is necessary to accounting. Going concern assumptions, he continued, imply a non-existent 'steady-state'. In determining historic costs there are practical difficulties; and in predicting future courses there are logical difficulties which are not shared in applying market prices at any one time to assets held. He concluded that contemporary accounting would enable us to purge the concept. Continuity must be determined, not assumed, as we choose the right valuation method.

Finally we may note that Arthur Andersen and Co., in establishing 'The Objectives of Financial

¹ *The Valuation of Property* (McGraw-Hill, 1937), p. 29.

² The case-studies were made and data collected by Mrs. R. Barton, BComm, CA, MSc, under my supervision, and were presented for her Master's degree. I am much indebted to her for her co-operation.

³ As quoted by R. J. Chambers in his *Accounting, Finance and Management* (Arthur Andersen and Co., 1968), p. 101.

⁴ See *Accounting and Business Research*, Autumn 1972. Two of his firms preferred to break up redundant equipment rather than let competitors have it.

⁵ *Journal of Accounting Research*, VI, 1, pp. 38–50, Spring, 1968.

⁶ *A Valuation Experiment* in J.A.R. VII, 1, pp. 90–96, Spring, 1969.

⁷ *International Journal of Accounting*, VI, 2, Spring 1971.

⁸ *Accounting Review*, XLIII, pp. 651–656, October 1968.

⁹ *Ibid.*, pp. 481–502, July 1968.

Statements for Business Enterprises',¹⁰ found that the convention has become entrenched and abused as a basis for precluding the reflection of economic realities. Obvious and large changes in value, upwards and downwards, as in the case of the American railroads, have not been recognised. It may be appropriate as a reason for not recognising distress values under normal, usual conditions;¹¹ but where share ownership is constantly changing, assets should be characterised by their exchangeability and as being 'capable of securing or satisfying the claims held by creditors or the equities of stock-holders'.¹² Exchangeability should suggest not that it is necessarily immediately marketable, but that it has value in and of itself, and is separable from the business as a whole.¹³

Going . . . Going . . . Gone

Thus it is not easy to escape from the original definition of asset, i.e. *assez* or enough to pay off liabilities. But Chambers prefers to ascribe values which will measure the ability of a company to adapt. Assets, or economic means, may be classified according to various properties – their range of functions, durability and substitutability, for instance.¹⁴ He defines them as 'any severable means in the possession of an entity',¹⁵ to be measured in terms of 'the monetary equivalent, the market price if sold'.¹⁶

Faced by a choice between balance sheet values as predictors of expected cash flows and profits, or of possible realisations on orderly liquidation, or as predictors of probable realisations on forced liquidation, Chambers prefers the second, even though expectations as to the life of a firm or of its asset holdings are constantly being revised, as attested by the frequency with which firms liquidate or merge. 'The revision of expectations as to a firm's life takes the same course as the revision of decisions as to particular assets of the firm . . . This may seem to imply that liquidation of a firm in its entirety is an ever present assumption. But this is not so'. In forced liquidation sales are made under duress. Current Cash Equivalents (CCEs) should be assessed on the basis of orderly liquidation. 'Unless a firm is in process of orderly liquidation, it can scarcely be described as going'.¹⁷

The distinction is obviously a fine one. The gap

between forced and orderly liquidation might be bridged by a study of the valuations and decisions on voluntary liquidation, or of receivers deciding whether to continue or liquidate. But Chambers himself can imply that identical asset values will help management in orderly, piecemeal liquidation, and shareholders in liquidating the whole firm.¹⁸ Moreover, he does not pause to justify CCEs as providing information better designed than alternatives to protect creditors, or to give warning of insolvency. Indeed CCEs would appear to indicate insolvency for firms with non-marketable plant, however profitable it may be in operation, and to reflect at least some of the losses which would result.

Balance Sheets of course have been compulsorily published as protection to creditors of firms with limited liability. While Gynther has suggested that actions for damages could threaten auditors of balance sheets, which report out-of-date historical costs,¹⁹ none have recommended that forced sale values should be reported to provide security in the worst event. Auditors bear a heavy responsibility if they insist on disclosures which result in perhaps unnecessary liquidation.²⁰ An original draft of the EEC's Directive No. 4 required auditors to report facts which either imperil a company's existence or might seriously affect its progress. Yet this was felt to put too heavy a responsibility on to the auditor.²¹

Instead, some have commended Cash Flow Statements as potentially highlighting the Rolls-Royce type of situation.²² Alternatively, sophisticated ratios have been advocated as giving warning. C. G. Johnson concluded that the ratios calculated from financial reports by Altmann, Beaver and others do not provide clear evidence of ability to predict failures.²³ Baruch Lev applied informational decomposition measures and, from application to 37 matched pairs of continuing and liquidating firms, found that his Balance Sheet Information Measure was better than all the traditional ratios, except Cash Flow/Total Debt.²⁴

With such prediction we were not immediately concerned, for we examined 20 balance sheets simply

¹⁰ Published 1972.

¹¹ Op. cit., pp. 40–41.

¹² Ibid., p. 48.

¹³ Ibid., p. 14.

¹⁴ *Accounting, Evaluation and Economic Behaviour* (Prentice-Hall, 1966), p. 47.

¹⁵ Ibid., p. 103.

¹⁶ Ibid., p. 77.

¹⁷ Ibid., p. 203–4.

¹⁸ See his contribution to *Asset Valuation and Income Determination* (edited R. R. Sterling, Kansas, 1971), p. 89.

¹⁹ See *Accounting for Changing Prices* in the Chartered Accountant of Australia, XLII, December 1971.

²⁰ See Sterling, op. cit. in note 9. G. Holmes clarifies English auditing practice in 'Going, Going . . . Gone' in *Accountancy*, September 1969.

²¹ See Dr. Schattinga's article in *The Accountant's Magazine*, LXXV, April 1971, p. 170.

²² See the DTI inspector's remarks reported in *Accountancy Age*, 10/8/73.

²³ *Ratio Analysis and the Prediction of Firm Failure* in *Journal of Finance*, December 1970.

²⁴ See his article in *Accounting in Perspective* (ed. R. R. Sterling and Bentz, S.W. Publishing, 1971).

for their reliability as predictors of values under forced realisation. One need neither exaggerate nor minimise the real and the accepted life expectancies before liquidation for assets, projects and firms. In an age of mergers and asset-stripping, there is clearly a case, not only for assessments of the present values of future cash flows, but also for frequent, perhaps annual and reported, appraisal of realisable values. With the difficulties and reliability of such appraisal we are in great part concerned.

Sample and Method

As the Handley-Page, Rolls-Royce and other cases have shown, there is real fascination in the death-throes of a company. For our study of book-values, realisable values and realised values, privileged access was gained to the files of offices engaged in liquidations. A sample of 20 recently failed firms was selected – few enough to enable cases and problem areas to be examined in detail, but large enough to include a range of size of firm, of industries and of asset types, and to enable stratified ratios to be calculated: these of course require confirmation or modification through much wider sampling.

Cases were coded according to Standard Industrial Classification, and ranged widely, from farming through water distillation, building, road haulage, financing and hotels, for instance, to dry cleaning. (For details see Table 4.)

The sizes of firms in our sample are given in Table 1, ranked according to Balance Sheet asset totals. Our sample could be related to mortality tables for each size of firm, but these have been stratified by number of employees,²⁵ or by capital employed.²⁶ Paid-up share capital in our cases represented a small proportion of total assets.

An alternative check on our sample could be obtained by rigorous comparison of ages on liquidation. *Faute de mieux*, in Table 2, we compare our sample with the hundred firms selected in effect at random by Brough from liquidations in England and Wales in 1965.²⁷ Failure rates for infant firms are so high that our sample is patently biased towards maturer firms. Our intention was to avoid the problems of infancy, and to compare the valuation

TABLE 1
The sizes of firms in our sample

| Size code | Boundary (£000 Balance Sheet Assets) | No. of firms |
|-----------|--|--------------|
| 1 | <5 | 1 |
| 2 | 5–10 | 1 |
| 3 | 10–50 | 8 |
| 4 | 50–100 | 5 |
| 5 | 100–250 | 1 |
| 6 | 250–500 | 1 |
| 7 | 500–1,000 | 3 |
| | | — |
| | | 20 |
| | | — |

TABLE 2
Ages of firms on liquidation for two samples

| Years | Strathclyde sample 1965 England and Wales Sample | |
|-------|---|-----------|
| | % | % |
| 1 | — | 6 |
| 1–2 | — | 20 |
| 2–3 | — | 9 |
| 3–4 | — | 15 |
| 4–5 | — | 12 |
| 5–10 | 25 | 17 |
| 10 | 75 | 21 |
| | — | — |
| | 100 = 20 firms | 100 firms |
| | — | — |

problems in mature liquidating firms with those in mature, going concerns. Although our sample might have aimed to represent typical liquidations, more appropriately it should have been stratified and weighted in accordance with the total population of existing companies.

A more serious problem arises over the comparability of valuations made at different times. Land might be shown at its cost 20 years before; balance sheets would be finalised weeks after year-end, and months before the Statement of Affairs, which records estimates of sums receivable months later. In each case we plotted t_1 , the age of the company

²⁵ The Bolton Inquiry on Small Firms (Cmnd 4811, HMSO, 1971) gave mortality ratios for firms employing 200 or fewer.

²⁶ J. M. Samuels shows the probability of Surviving Merger and Liquidation for quoted companies thus classified. See Table II in *Companies and the Institutional Investor* in BAFA's Occasional Paper, No. 1.

²⁷ R. Brough, *Business Failures in England and Wales* in Business Ratios II (Dunn and Bradstreet, October 1971). R. P. Brooker and Smith reported English Insolvency Statistics in 1956, in *Abacus*, December 1965.

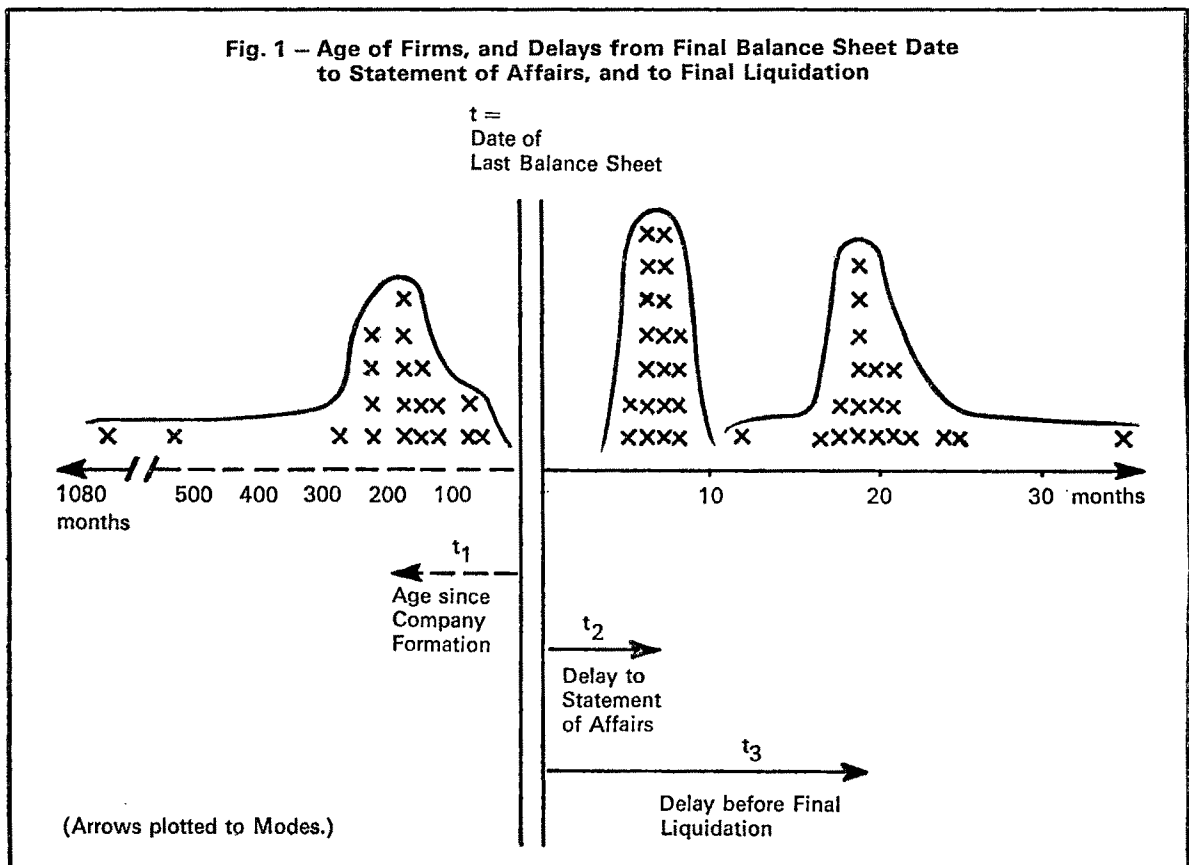
on last balance sheet date; t_2 , the delays thereafter before the Statement of Affairs, and t_3 , before final realisation. From Figure 1, we see firstly that the typical firm in our sample was 15 years old – such was the time-span over which historical costs, for example of land, could have become outdated. Secondly, we observe a concentration of Statements of Affairs in the third quarter-year after Balance Sheet date. Our data thus suggests that annual reports, circulated perhaps three months after year-end, provide information for directors and creditors that drastic action is required. The six months typically intervening between year-end and Creditors' Meeting may have seen large losses or material changes in asset disposition. We neither assessed nor adjusted for such changes, but assumed an identity of underlying assets.

We further observe a modal twelve-month delay between Statement of Affairs and final realisation. Some firms may have operating cycles in excess of one year, but our liquidators seemed to work to a time-horizon equal to or greater than the typical currency period, without exceptional or forced urgency except in realising long-term assets, and in

totally liquidating what are normally circulating stocks or 'funds'.

We coded each valuation by Book-valuation method, by market or realisation method, by Valuation procedure and by valuer. We attempted thus to record how stock had been valued and plant depreciated, which valuer used which method and whether realisations took place differently from the way anticipated. In the case of Debtors we coded whether the Statement of Affairs value resulted from aging, from name and credit-worthiness rating, through contacting debtors individually or by circular, or through a collection agency. In practice we found that our classifications and information were not exact enough, and that our sample was too small to enable any calculation of how methods or valuers ranked in reliability in predicting realised values. Later researchers might build on our efforts.

One major assumption was that the finally negotiated value represented the best or real market price. Assets were variously disposed of – by auction, or private treaty, with or without advertisement: in the case of debts they were collected. One purpose of the earlier valuations was to give the liquidator a



price or target, which we shall see he seldom achieved. Nevertheless valuations by a qualified professional man often served as the basis for both parties in later negotiations.

A valuer's problems are great, both in theory and practice, especially in second-hand markets: nor do they arise uniquely for forced sales. Economists have developed full-cost theories for the design, mass-production and quality control of goods destined to reach their first users through well developed markets. But from acquisition date onwards, through use and ownership, these goods become progressively less comparable. Marginal price-theory too tends to collapse in second-hand markets, and when the production line suddenly stops. But when goods have longer lives than their owners, a second-hand market develops, where one firm's realisable values is another firm's replacement price, if one allows for 'market turn', dismantling, transport and installation costs. Wiles has usefully categorised markets and pricing methods: much of the second-hand market is carried out by what he calls 'primitive higgling'; and here pricing may be least transparent.²⁸ Perhaps markets could be further classified, according to whether they provide amateur or expert with a single, with a consistent or with a forecastable price. Are prices given, or must they be taken? A company director may be an expert if optimistic valuer on his usual entry and exit markets. But if he intends to sell, instead of buy, or to operate on second-hand markets, different prices may apply, and other valuers may be more knowledgeable. The problems vary with each class of asset and alternative market.

One of the constraints on improving the reliability of valuations is of course cost. A valuation of heritable property should be charged on scales from 1 per cent to $\frac{1}{4}$ per cent. Plant can be valued for from 2 per cent of its value downwards; movable effects from £5 per £100 downwards. The charges for auctioning goods may be as high as 15 per cent. The liquidator of a firm will make a lump sum charge, plus expenses, with a 10 per cent charge on realisations, and a lesser charge on sums distributed. The data to which we had access was thus not cheaply obtained.

Let us conclude with a formal model: For each firm and class of asset we recorded three values. V_1 represents final Balance Sheet value. V_2 was the estimate of realisable value recorded in the Statement of Affairs. V_3 was the money actually received. MacDonald,²⁹ after Ijiri and Jaedicke, suggests that valuations and measurements are a function of the object measured (O), its attributes (A), of the rules

of measurement applied (R), by specific measurers (M), and under certain constraints (C). In formula:

$$V = f(O, A, M, R, C)$$

Using this notation we find that the objects measured were identically classified: we avoided cases where separate values were not estimated and negotiated for each asset class. (We also made no attempt to apply our method to the liabilities side, where no creditors received more than 50p in the £.) We presumed that the objects measured neither changed nor diminished physically from t to t_3 . The attributes (A) in each case were monetary values on a market, but the rules variously applied prescribed entry or exit values as base. These rules (R) varied from precise depreciation methods and rates, to an application of the valuer's 'skill, knowledge, practical experience and the knowledge and ability to appreciate the factors which influence value'.³⁰ We hoped to reduce such mystique to rules, or to apply the economists' price theory in practical estimating, but we were not very successful. Values attributed by accountants, or assessed by valuers (M) were often used in price-fixing, despite evidence of dispersion in estimates. We also observed varying constraints (C), for instance on time allowed to produce a Balance Sheet or Statement, or to complete a liquidation; and on cost, for which reason second or third opinions of value were not obtained by liquidators, nor were wider advertisement or alternative means of realisation often attempted. The general formula has thus some relevance to our valuations.

Asset Valuations

We calculated the reliability of V_1 and V_2 as forecasts or approximations of V_3 for each firm's classified and total assets, and for all assets in our sample. In Table 3 we show these ratios for each asset class, expressed as an unweighted average of ratios

$$\frac{\sum V_1}{\sum V_3} \text{ and as a mean or weighted average } \frac{\sum V_1}{\sum V_3},$$

together with the maximum and minimum ratios to give some measure of range and skewness. In almost every case the average exceeds the mean, indicating that either the book-keeping and valuations for small companies are less prudent than that for larger firms, or – more probably – that the markets wither in price and predictability for small firms and lots. If the average ratios measure the displacement resulting from main changes in measurement rules and constraints, we have calculated as further measure of dispersion, the standard deviation. This shows the

²⁸ P. J. Wiles, *Price, Cost and Output* (Blackwell, 1961), *passim*.

²⁹ *Op. cit.* in note 5.

³⁰ D. Napley, *Law of Auction* (Sweet and Maxwell, 1954), p. 336.

TABLE 3
Ratios of valuations to realised values for asset classes

| Asset Class | No. of Cases | Balance Sheet Values V_1/V_3 | | | | | Statement of Affairs V_2/V_3 | | | | |
|------------------------|--------------|--------------------------------|------|------|------|-----------------|--------------------------------|------|------|------|-----------|
| | | Max. | Av. | Mean | Min. | Std. Dev. \pm | Max. | Av. | Mean | Min. | Std. Dev. |
| Land | 2 | 1.1 | .91 | .99 | .74 | .17 | 1.1 | 1.10 | 1.11 | 1.09 | 0.1 |
| Land and buildings | 15 | ∞ | 1.21 | 1.10 | .95 | .59 | ∞ | 1.09 | 1.07 | .93 | 0.20 |
| Plant and machinery | 16 | 18.9 | 5.3 | 2.8 | 2.1 | 4.3 | 3.6 | 1.8 | 1.3 | 1.1 | 0.7 |
| Furniture and fittings | 16 | 7.1 | 4.1 | 3.0 | 2.2 | 1.4 | 2.9 | 1.6 | 1.2 | .8 | 0.6 |
| Motor vehicles | 18 | 5.3 | 2.1 | 1.8 | 1.2 | 1.0 | 3.1 | 1.3 | 1.2 | 1.0 | 0.5 |
| <i>Stocks</i> | | | | | | | | | | | |
| Raw materials | 7 | 13.3 | 6.0 | 1.6 | 1.5 | 4.8 | 4.0 | 2.3 | 1.1 | 1.05 | 1.1 |
| Work in progress | 9 | 250.0 | 59.0 | 1.9 | 1.7 | 83.0 | 25.0 | 6.2 | 1.5 | 1.1 | 7.6 |
| Finished goods | 7 | 1260.0 | 3.4 | 2.6 | 1.8 | 1.2 | 2.5 | 1.7 | 1.4 | 1.3 | 0.4 |
| Consumables | 3 | 6.0 | 4.7 | 5.4 | 4.0 | 1.1 | 3.0 | 2.4 | 2.7 | 2.0 | 0.5 |
| Debtors | 17 | 3.8 | 1.8 | 1.5 | 1.2 | 0.6 | 1.8 | 1.2 | 1.2 | 1.05 | 0.2 |

range on either side of the average covering two-thirds of the observations.

Each firm's assets were coded in sequence of orderly liquidation.³¹ Goodwill appeared in three cases, and trade marks in two. For one firm Goodwill represented 10 per cent of Balance Sheet assets; but in no other case did intangibles amount to 1 per cent. None was worth anything. A loan to a director was largely recovered. Advances on properties represented the majority of our finance company's large assets. These had been frequently updated in value: as a result only a 3 per cent loss was anticipated, but a 14 per cent loss was realised. Also absent from our asset classes is Cash. Holdings were in no case significant.

Land was our first main class, although only the farm and caravan site valued it separately. In one case there was a considerable gain on book values, in the other a loss. The valuers were over-optimistic in each case.

Land and building values have of course been intensively studied. According to Turvey,³² valuers should assess factors such as location, optimum

permitted use, size, shape and fertility. They may calculate the present value of its yield before or after development; or compare it with contiguous or similar property which has recently changed hands. When built on, gross floor areas, convenience, design, repair, amenity and communications will all modify market values. Purpose-built property which has been unprofitably operated may be hard to sell. (In one of our cases, vandals moved into a warehouse before an occupier could be found: it had to be demolished at cost greater than the site value. We have tabulated this as an infinite over-statement in Balance Sheet and Statement of Affairs, but otherwise it has been excluded as providing a sixteenth 'rogue' set of values.) By and large we found our valuers willing to calculate from cost or book values, modifying as they thought necessary. Their normal overvaluations only in three cases exceeded a ratio of 1.2 to 1.

Property book values also came on the whole within an acceptable range.³³ Accountants have in the past apparently regarded land and buildings more as if entailed or heritable than as marketable. Take-over bids were common for firms with properties under-valued at historic cost in their books. But in half our

³¹ We used the Code described in my *Planning and Control Systems and the Management Accountant* in the B.C.S. Computer Bulletin, September 1967.

³² R. Turvey, *The Economics of Real Property* (Allen and Unwin, 1957), p. 26.

³³ K. Easter sets the acceptable range as within 15-20% of market values in *Putting a Price on Property* (Accountancy Age, 30/7/71).

cases values were only marginally under-recorded. As an exercise we applied to our property book values the most appropriate index of property price movements which we could obtain. The theoretical book values, thus adjusted, would have been 45 per cent of realisations instead of the actual 110 per cent. We hope that all price-level adjustments are not equally misleading.

Plant and machinery ratios were skewed upwards for smaller firms, and for limited use machines. It is perhaps surprising that none in our sample had equipment written down close to or below realisable values. Investment grants at this time were allowed only for new plant. Specialist valuers seemed to use no lists, derived from second-hand or refurbished machine prices. Their estimates were less reliable than for the next two classes.

With furniture and fittings we showed less extreme variations: perhaps they find wider uses and markets than unprofitable plant, and can be more readily transported to and from an auction sale. Motor vehicles, with known year of first registration and clearly identified, mass produced marquees, should find a fairly perfect market, but valuers over-estimated; and second-hand prices were not adequate to cover book values.

For current assets, we first examined stock values. 'True and fair values' were interpreted by the vast majority of firms questioned in a Scots Survey in the 1960s as meaning the lower of cost, replacement price or net realisable values, for all categories.³⁴ Raw materials made to specification accounted for maximum over-valuations in the first sub-classification. For Finished Goods the weighted mean ratio of Balance Sheet values was higher than for the earlier two classes, reflecting large losses on book values for distilled water, obsolete toys and 'last of the breed' appliances. In many such cases, orderly sale by directors might have produced not much better prices; and provision through write-downs should have been made in the books.

Our Work-in-progress values included one big contractor's certified work not yet claimed. The valuer wrote down balances by 15 per cent, but he failed to allow for penalties for breach which on some contracts amounted to £9,000. Yet the minimum over-statement of Work-in-progress was recorded in these books. Typical examples of the consequences of forced sale were:

| V_1 | V_2 | V_3 |
|---------|--------|-------|
| £10,000 | £1,000 | £100 |
| £500 | £300 | £50 |

Excluding the contractor, the weighted mean ratios were $V_2/V_3 = 1.44$ and $V_1/V_3 = 4.28$. But faced

with this last ratio, one must still remember that it was design and marketing problems which often underlay the immediate causes of failure; and that liquidators would be free to complete work if losses would thereby be avoided. For all stocks, except consumables, the valuers' mean reliability is markedly better than averages or maxima which reflect poor estimating for small lots.

For debtors, too, we have recorded the effects of imprudence by accountants and auditors. The extreme cases resulted from the 'domino' effect when a major customer and debtor went into liquidation, and there was no dividend to creditors. In another case book debts of over £300,000 were valued at £200,000, but only £140,000 was received, partly through the effects of another bankruptcy. Our cases were not exceptional in over-reliance on trade-credit—and in their need to make and revise continually estimates of credit-worthiness together with adequate bad-debts provisions. Our study is therefore relevant to all accountants. Possible outcomes for creditors should be assessable; but their interest is in aggregate realisable values, rather than in those of each class separately.

Aggregate Values

In Table 4 we show the ratios for the total assets of each firm. Weighted mean ratios are given, together with the minimum and maximum range for assets owned. (In these last, intangibles are ignored—as is one case where a lease realised £3,000 although it had not been previously valued.) We have listed our cases in order of reliability of Balance Sheet total values (or in descending range of displacement as measured in the mean ratio). Against each firm we give its Standard Industrial Classification, and its size, as per Table 1 groups.

Through weighting and aggregation, the extremes in individual asset classes have become smoothed. For Balance Sheet values, the average of the means (1.95), is above the median firm (1.77) and well above the weighted mean for the whole sample (1.60). We see that the mean ratio tends to reduce less from firm to firm as we move down the table; and we know that our firms tend to tail out towards the largest size groups, which themselves have wider ranges. We have already observed a tendency towards better book-keeping and prices for larger lots and firms. From the Size codings in Table 4 this is confirmed. Three large firms group around the sample mean, and the third largest is far below it.

³⁴ See *Valuation of Stocks and Work-in-Progress*—An Accounting Research Study by the ICA(S), January 1968, p. 25. There is no explicit reference to Going Concern Values.

TABLE 4

Ratios of valuations to realised values – Total assets for each firm listed in increasing order of book value reliability

| Firm code | Size group | S.I.C. | V_1/V_3 – Balance Sheet Values | | | V_2/V_3 – Statement of Affairs | | |
|-----------------------------|------------|--------|----------------------------------|------|------|----------------------------------|------|------|
| | | | Max. | Mean | Min. | Max. | Mean | Min. |
| J | 3 | 232 | 58.0 | 4.00 | 1.8 | 5.5 | 1.33 | 0.8 |
| I | 5 | 368 | 100.0 | 3.33 | 1.4 | 10.0 | 2.00 | 1.1 |
| G | 4 | 399 | ∞ | 3.20 | 1.5 | ∞ | 1.67 | 1.1 |
| D | 3 | 500 | 7.1 | 2.60 | 1.5 | 3.6 | 1.15 | 1.1 |
| A | 3 | 486 | 9.6 | 2.56 | 1.3 | 4.0 | 1.23 | 1.05 |
| | | | | | | | | |
| L | 4 | 368 | 100.0 | 2.44 | 1.5 | 6.0 | 1.30 | 1.12 |
| T | 4 | 494 | 250.0 | 2.14 | 1.15 | 25.0 | 1.37 | 1.11 |
| E | 3 | 232 | 1260.0 | 1.97 | 0.97 | 4.0 | 1.04 | 1.02 |
| M | 3 | 820 | 5.0 | 1.84 | 1.2 | 2.1 | 1.28 | 1.08 |
| K | 7 | 812 | 3.3 | 1.78 | 0.97 | 1.4 | 1.17 | 0.93 |
| | | | | | | | | |
| S | 4 | 419 | 4.0 | 1.77 | 1.02 | 2.3 | 1.31 | 1.02 |
| B | 6 | 311 | 3.7 | 1.69 | 1.60 | 1.6 | 1.17 | 1.05 |
| C | 7 | 500 | 2.4 | 1.57 | 1.2 | 1.5 | 1.27 | 1.02 |
| N | 3 | 703 | 6.3 | 1.28 | 0.96 | 2.1 | 1.07 | 0.96 |
| Q | 4 | 884 | 6.0 | 1.28 | 1.1 | 3.0 | 1.14 | 1.1 |
| | | | | | | | | |
| F | 1 | 893 | 3.0 | 1.18 | 0.98 | 1.4 | 1.08 | 1.02 |
| H | 2 | 860 | 7.1 | 1.17 | 0.97 | 2.9 | 1.05 | 0.97 |
| O | 7 | 862 | 1.2 | 1.16 | 0.95 | 1.1 | 1.13 | 0.95 |
| R | 3 | 884 | 4.6 | 1.08 | 0.95 | 2.0 | 1.08 | 1.05 |
| P | 3 | 001 | 7.5 | 1.01 | 0.74 | 3.0 | 1.10 | 1.00 |
| | | | | | | | | |
| Simple Average | | | | 1.95 | | 1.25 | | |
| Standard Deviation on above | | | | .84 | | 0.21 | | |
| Sample Weighted Mean | | | | 1.60 | | 1.20 | | |

This distribution of ratios might not apply to all liquidated firms, since we avoided the smallest.

Our data supports another odd conclusion. Broadly speaking, the SIC lists its codes from agriculture and basic manufacture through to distribution and the services. Excluding our farm, where land value increases compensated for other losses, the service industries are largely concentrated with the lowest mean ratios and the most reliable Balance Sheets.

The performance in Statement of Affairs valuations is not similarly ranked: but there were certainly shocks for creditors. Indeed it is tempting to assume

that these valuations were all fair prices, and that the over-estimations reflect the effects of forced sale, or of presumed liquidator inexperience in finding the best markets. This would not be fair. The professional valuers knew the purpose for which their valuations were required, and usually conveyed to the liquidator which method of sale they had anticipated as yielding the best return. He in turn was guided by their prices and advice, was motivated by a considerable commission, and was in no way bound to dispose of each asset individually.

Like good asset strippers, liquidators behave according to the rules prescribed by McKeown for

calculating NRVs on a routine basis.³⁵ They should obtain prices for each asset and each possible group of assets (i.e. $2^n - 1$), and should select the most advantageous grouping. Where bloc or going concern sale commends itself, then there is an argument for including in Balance Sheets and Statements of Affairs an item for Goodwill, in addition to the sum of realisable values for each separate asset. We sought cases where three values could be found for each asset class: nevertheless in our sample better individual prices were sometimes achieved by joint or bloc negotiation than by despatching each asset to its own appropriate market. Larson and Schattke suggest that this problem of aggregation and additivity of variously separable and disposable assets makes the notion of current market price for an asset ambiguous, just as with interacting assets it is seldom possible to attribute to each a contribution to revenue and thus to calculate Present Values.³⁶

Conclusions

Conclusions may be drawn, firstly about wide, conservation matters; secondly, on the professional competence and claims of accountants and auditors; and thirdly, about the feasibility and adequacy of Chambers' theory. Our 20 liquidations are not alone in challenging those who concentrate on the costs and added values of the cycle of extraction-production-assembly and sale before brief pride in ownership, discard and incineration. Early in this cycle, there can also be reduction in value. Strip steel stamped out for bottle tops is reduced in general utility, and even more so by the imprint of a trade name. Unique, trade marked designs may yield quasi-monopoly profits, or a nil realisable value. Limited use plant may be eagerly sought by entrants to an industry – but if it is being disposed of by the first of those to 'abandon ship', it may find no ready market. Sometimes it is in the interest of manufacturers to ensure a good second-hand market and exchange value for their products. Unless there is to be only one workshop of the world, and one optimum mix of inputs, a downward flow of producer goods from advanced countries to those with intermediate technology should be expected and encouraged.³⁷ There is thus a need and challenge not only to find and to assess second-hand markets, but also to create them. The tunnel vision of the wealth

producers³⁸ must not infrequently be deflected by prisms to reveal social and opportunity costs.

Secondly, accountants and auditors may learn something from the practical skills of past and present liquidators, and from the sensitivity to markets of professional valuers. At times, we have sought to deny any claim to expertise in assessing market values, and confined ourselves to showing the results of past transactions. But to complement the knowledge and skilled pricing of purchasing and sales staff in normal entry and exit markets, either in the accountancy department or outside the firm skills in assessing alternative uses and markets must be found. There may be dangers in suggesting that profits are made through market operations, not production.³⁹ Yet if asset-strippers do not have their say, they may have their Day!

Realisable values then may be of relevance not only to financial statements and income determination but also to a range of decision models, for replacement as well as bail-out, for viability as well as cash-flow forecasting. We have seen that time horizons should be clarified and short, if discounting is to be avoided.⁴⁰ We have seen that valuations cannot rely solely on perfect markets, list or quoted prices,⁴¹ or on the price theories of economists. Nor can the costs of valuing or obtaining prices, and the costs of clearance and delivery be logically ignored. Sometimes net

³⁷ Information on second-hand markets is scarce. The recently developed Second-hand Computer Market in Europe is described by J. O. Jenkins in the *Computer Bulletin* of December 1972. Apparently the governments of developing countries aspire to replace old Dakotas with Concordes, rather than with second-hand Boeings! More significantly, multinationals sometimes pass on labour intensive plant to factories in developing countries.

³⁸ Protagonists of the planned growth of firms and of economies will tend to be less interested in adaptation by realisation. F. K. Wright has emphasised the contraction presupposed by Chambers. See *Adaptation and the Asset Measurement Problem in Abacus*, August 1967.

³⁹ N. Bedford and McKeown in their *Comparative Analysis of NRV and Replacement Cost (Accounting Review XLVII, p. 336, April 1972)* express this fear.

⁴⁰ The same authors suggest NRV should mean 'the maximum amount which can be realised from the disposal of that asset within a short period of time (not a forced sale situation but not long enough to allow disposal of fixed assets through ordinary use of services)'. Their net amount is defined as the NRV discounted to the point of measurement. But it should be the market which attributes immediate value, and allows for risk and delay, or a quite different DCF model is being used.

⁴¹ G. J. Foster in *Mining Inventories in a Current Price Accounting System (Abacus V, 2, pp. 99-119, December 1969)* found that for 10 out of 13 minerals, buying schedules or assured market prices provided an objective basis for valuation of stocks, except for broken ore and work-in-progress, to which 88% of Australian firms examined already gave a nil value. Perhaps the three minerals for which market prices were not readily available are more typical.

³⁵ *The Additivity of NRVs - The Accounting Review, XLVII, pp. 527-533, July 1972.*

³⁶ *Current Cash Equivalents, Additivity and Financial Action in The Accounting Review, XLI, October 1966, p. 640.*

realisable values will be negative: seldom will they in practice be nil. The above remarks are relevant to Chambers' theory. We have also suggested that he is on uncertain ground in excluding non-severable trade-marks and goodwill, yet including some element of goodwill in the added values or 'product surround' of finished goods which customers expect will continue to be supplied and serviced by a going concern. If forced sale by skilled liquidators results in lower prices than orderly sale within similar time-spans by ongoing managers, then we must clarify for which assets and for which markets do the circumstances of the seller affect demand and price. Only in some houses do unhappy ghosts haunt new owners.

Our approach may be justified by a final analogy. Since the Middle Ages, anatomy and mortality tables have contributed to natural, mathematical and even the social sciences. The study of the body as a

measurable machine was accompanied by studies of the so-called 'ghost in the machine'.⁴² We have here recorded measurements of the living and the newly dead. For some purposes at least, there would seem to be logic in measuring 'bodies' and 'limbs' identically for both living and dead, and in valuing them as though immediately severed and disposed of. For reasons we have not elaborated fully, a going concern may be able to obtain measurably better values immediately. The chief differences, however, lie not between forced and orderly liquidation assumptions, but in the models and measurable attributes appropriate to living and dead entities. The valuations and ratios we have studied should therefore neither be ignored nor inappropriately applied.

⁴² The phrase is Elliott Jaques's, who in *Product Analysis Pricing* (Heinemann, 1965) shows how this and kindred contributants to added values are allowed for in stock valuation.

Enterprise Accounting in the USSR

D. T. Bailey

1. Introduction*

It is a noteworthy fact that of the major political thinkers of Western civilisation from the time of the ancient Greek city states until contemporary times V. I. Lenin was alone in devoting considerable thought to the role of accounting in society. This attention to accounting was aroused not because he was concerned with the mere minutiae of the day-by-day functioning of a society. Instead, it may be attributed to his being a revolutionary political thinker deeply interested in the practical realisation of his political theories. In his scheme of ideas for the oversight of the non-capitalist society that prevailed in Russia following the collapse of the Tsarist autocracy in 1917, and also for the management of the future socialist society, accounting was allotted a major role.

During the summer of 1917 and some three months before the October Revolution in which Lenin and the Bolsheviks assumed political power, he wrote:¹

'Accounting and control² – that is the main thing for "arranging" the smooth working, the correct functioning of the first phase of communist society.'

*In the Autumn 1972 issue of *Accounting and Business Research* there appeared an article 'Financial Management in the Soviet Industrial Enterprise'. Much of the analysis there described is undertaken by such bodies as Gosbank and in the industrial ministries in the course of supervising the enterprise's activities. Within the enterprise such work tends to be carried out by the chief economist, a post introduced during the early 1960s. The chief book-keeper in exercising his function of state controllership is concerned primarily with the generation of accounting data, the subject of the present paper.

¹V. I. Lenin, *The State and Revolution in Questions of the Socialist Organisation of the Economy* – articles and speeches (Progress Publishers, Moscow, undated) p. 71.

²Although 'accounting and control' is the accepted translation for 'uchet i kontrol' it does not fully convey the import of Lenin's ideas. At the time when Lenin was writing the contemporary Russian word for accounting was schetvodstvo. Uchet has a broader meaning. The sense of the phrase may be rendered into English as 'the keeping and verification of notational records'.

And, on a number of occasions during the early years of Soviet power until his death in 1924, Lenin reiterated this point:

'Socialism – first of all this is accounting.'³

With the abolition of private ownership of the means of production it was visualised by Lenin and the leading Bolsheviks that, instead of a relatively small number of entrepreneurs responding via the market mechanism to the pattern of demand for goods and services exhibited by an unequal distribution of spending power across the community, the planning mechanism would determine the overall economic and social goals of society, their priority ranking and the allocation of the available resources to ensure their achievement.

It was fully appreciated that with the abolition of the market as a test of economic efficiency some alternative mechanism would be needed to ensure that the nation's resources were not dissipated. The accounting mechanism, as a surrogate for the play of market forces, was intended to provide for a continuous monitoring both for the safe custody of the resources from time to time entrusted to individual units of economic activity and for their efficient utilisation in the provision of goods and services to the community.

As has been remarked elsewhere:

'Whenever by any means the test of productive efficiency imposed by competition in a free market is removed, a comparison of costs of different concerns becomes the only guide to an economic price, and such a comparison is impossible without standardised accounts.'⁴

Planning and accounting were visualised as complementary tools to be utilised in the industrial and social restructuring of the country, following the expropriation of the entrepreneurs, and in the realisation of its subsequent development in accord-

³V. I. Lenin *Collected Works* (Moscow), Vol. 26, p. 255.

⁴H. W. Singer, *Standardised Accountancy in Germany*, National Institute of Economic and Social Research Occasional Paper V (Cambridge University Press, 1943), p. 7.

ance with the predetermined goals.

It was for these reasons that Lenin had no doubts of the critical role of accounting, of its contribution, to the efficient functioning of the nascent Soviet state.

Since the early days of Soviet power accounting has been a continuing preoccupation of the leading organs of political power so that it has evolved to the position today when, in the words of the Soviet accounting academic Professor N. V. Dembinskii:

'... the purpose of Soviet book-keeping is the reflection of the course of the process of production, distribution, exchange and consumption of the social product and the control of its realisation in the interests of the greatest satisfaction of the continuously expanding needs of society and for the safe custody and utilisation of society's socialist property.'⁵

2. History

The interest of a Russian government in the practice of book-keeping was not wholly unique to the decades following the October Revolution. At the beginning of the eighteenth century, according to Mazdorov,⁶ Tsar Peter I endeavoured to introduce accounting practices into the state factories in the form of a single entry accounting for monetary receipts and outlays. The primary function fulfilled by this record keeping appears to have been a control of earnings remitted to Moscow. The first Russian language book to give a systematic exposition of book-keeping was published in 1783,⁷ the first journal devoted to the theory and practice of accounting commenced publication in 1888,⁸ and the scope for the application of mathematical methods of book-keeping was being investigated by some theorists during the early years of the twentieth century.⁹

Within a short time of the October Revolution of 1917 the oversight of business book-keeping commenced but it was not until the 16th Congress of the Communist Party, held in 1931, that a decision was taken to develop and install a system of standardised accounting.¹⁰ The implementation of this decision was to be extended over several decades. The importance of the factory book-keeper during the rapid

industrialisation of the 1930s may be judged by the statement of G. K. Ordjonikidze, a prominent member of the Soviet government, that:

'... the book-keeper must be one of the most important figures of our industrial enterprises... the most intimate assistant of the factory director so as to signal to him daily and monthly how the business is progressing.'¹¹

During the 1940-50s schemes of uniform accounting were extended to various branches of the national economy¹² and, on the basis of this experience, a standardised accounting system was worked out in 1957-59 and came into force on the 1 January, 1960.¹³ According to Bigvava¹⁴ it required considerable combined efforts by the Ministry of Finance and the Central Statistical Administration to achieve a unified book-keeping system in the main branches of the national economy. The system is applied, or intended to be applied, throughout the Soviet Union in all industrial and commercial enterprises and, with appropriate modifications, in agricultural undertakings and other organisations and institutions. The system is applied irrespective of whether the entity is profit-making, subsidised or wholly state financed.

The implementation of the nation-wide system of standardised accounting, by providing the Council of Ministers with a continuous monitoring of the performance of economic and social activities in financial terms, made possible a delegation of responsibilities for decision-making to the units of micro-economic activity without a loss of overall control of economic performance by the national leadership. Consequently, it seems reasonable to infer that the evolution of Soviet accounting practice to this stage was a necessary pre-condition for the introduction in 1965 of the economic reform whereby there was a devolution of decision-making discretion to the chief executives of the enterprises and a corresponding emphasis upon profitability as a success criterion. In this connection one may usefully draw a parallel with a diversified concern, which operates in a capitalist economy, introducing common accounting principles and practice throughout its organisation prior to the introduction of the concept of profit centres and the partial delegation from top management to local management of a limited range of decision-making powers. Consequent upon the introduction of the economic reform some modifications

⁵N. V. Dembinskii, *Teoriya Sovetskogo Bukhgalterskogo Ucheta* (The Theory of Soviet Book-keeping), (Minsk, 1957), p. 25.

⁶V. A. Mazdorov, *Istoriya Razvitiya Bukhgalterskogo Ucheta v SSSR* (The History of the Development of Book-keeping in the USSR), (Moscow, 1972), p. 6.

⁷V. A. Mazdorov, *op. cit.*, p. 32.

⁸V. A. Mazdorov, *op. cit.*, p. 38.

⁹V. A. Mazdorov, *loc. cit.*

¹⁰N. V. Dembinskii, *loc. cit.*

¹¹V. A. Mazdorov, *op. cit.*, p. 139.

¹²V. A. Mazdorov, *op. cit.*, pp. 191-192.

¹³V. A. Mazdorov, *op. cit.*, p. 249.

¹⁴G. Bigvava, *O Povyshenii Urovnya Podgotovki Kadrov Bukhgalterov Ekonomistov, Bukhgalterskii Uchet*, 1970 Noll, pp. 46-47.

were made to the standardised accounting system and brought into effect on 1 January, 1969.¹⁵

The development of the standardised accounting system may be seen, also, as a necessary prerequisite to the realisation of the ambition announced at the 24th Congress of the Communist Party held in 1971: '... to build up a nationwide automated system for gathering and processing information for accounting, planning and economic guidance on the basis of a state system of computer centres and a single country-wide automated communications network'¹⁶ and thereby provide the country's planners with a more sensitive instrument by which to guide economic and social development.

3. Soviet book-keeping

Introduction

The term 'standardised accounting system' was originated by Singer¹⁷ to distinguish such a system from the more familiar uniform accounting system. The latter has been described as 'a set of principles and in some cases accounting methods which, when incorporated in the accounting systems of individual members of an industry, will result in obtaining of cost figures by the individual members of the industry on a comparable basis.'¹⁸ Thus, such systems are usually confined to a given industry, normally introduced voluntarily by the firms in that industry, and their application may be confined to the accounting procedures for cost ascertainment. On the other hand the chief attributes of a standardised system of accounting may be enumerated as:

- (1) compulsory imposition by the state;
- (2) universality of application to the units of micro-economic activity;
- (3) comprehensive coverage of the principal accounting records;
- (4) uniformity of accounting procedures.

The main ingredients of the Soviet system of standardised accounting¹⁹ are:

- (1) the accounts plan;
- (2) the approved systems for recording data and account keeping;

- (3) the standardisation of the accounting stationery;
- (4) the rules for the evaluation of physical entities and obligations of the enterprise;
- (5) the specification of the accounting entries for recording certain kinds of transactions;
- (6) the standardisation of the contents of the accounting returns;
- (7) the promulgation of time-tables for the rendering of accounting returns to the supervising authorities.

The main responsibility for ensuring the smooth operation of the overall system²⁰ has been borne by the Central Statistical Administration which is directly answerable to the Council of Ministers. It is the Council of Ministers which is responsible for ratifying the basic regulations governing the standardised accounting system. Methodological guidance in the exercise of book-keeping skills is entrusted to the Ministry of Finance. Within the general framework of the system delegated responsibility for further elaboration of subsidiary regulations needed to meet the requirements of particular segments of the economy are exercised by the all-union and union-republican ministries responsible for the functioning of specific industries (see Diagram 1). Other state organs such as the State Bank and the State Committee on Questions of Labour and Remuneration may collaborate in the working out of those regulations affecting matters in which they have an interest.

All enterprises have a chief, or senior, book-keeper who is responsible for the organisation and running of the book-keeping office and the operation of the accounting system. In all matters relating to the exercise of technical skills the chief book-keeper is answerable to the chief book-keeper of the next higher supervisory level within the ministry to which the enterprise is attached. In all other matters the chief book-keeper is answerable to the chief executive of the enterprise. Soviet writers frequently refer to the chief book-keeper as a state inspector and, indeed, he or she may be reasonably characterised as the all-seeing eye of the state administration charged with ensuring that the local management does not violate

¹⁵V. A. Mazdorov, op. cit., pp. 285-287.

¹⁶A. Kosygin, Directives of the 24th Congress of the Communist Party of the Soviet Union for the Five-Year Economic Development Plan of the USSR for 1971-1975 (Novosti, Moscow, 1971), pp. 62-63.

¹⁷H. W. Singer, op. cit., p. 12.

¹⁸Institute of Cost and Works Accountants, Uniform Cost Accounting and the Principles of Cost Ascertainment (ICWA, London, 1947), p. 9.

¹⁹Soviet writers refer to their system of accounting as *edinaya sistema narodnokhozyaistvennogo ucheta* or the unified system of national economic accounting.

²⁰The exposition of the Soviet accounting system in Sections 3-5 has been based upon the following sources:

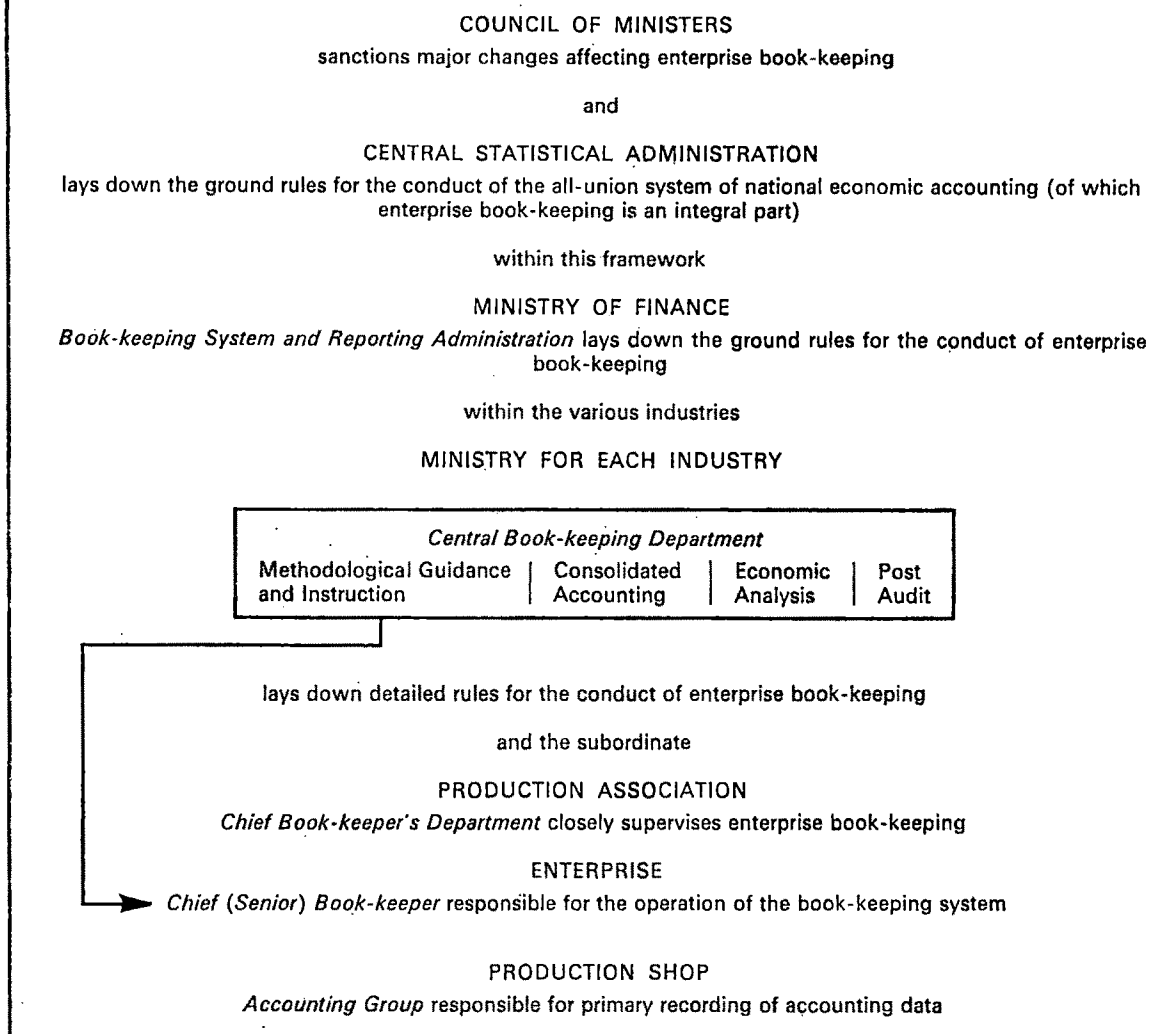
N. V. Dembinskii, op. cit.

L. Gringarten, *Alppom Naglyadnykh Posobii po Bukhgalterskomu Uchetu v Promyshlennosti i Storitel'stve* (Album of Visual Aids for Book-keeping in Industry and Construction), (Moscow, 1966).

P. A. Kostyuk, *Bukhgalterskii Slovar'* (Book-keeping Dictionary), (Minsk, 1971).

V. C. Makarov, *Teoriya Bukhgalterskogo Ucheta* (The Theory of Book-keeping), (Moscow, 1966).

P. N. Vasilenko, *Osnoby Bukhgalterskogo Ucheta* (The Fundamentals of Book-keeping), (Moscow, 1971).

Diagram 1: The Division of Responsibilities for Enterprise Book-keeping

the constraints, imposed by the higher planning authorities, and within which the enterprise is required to function while simultaneously fulfilling the requirements of the state plan. The regulations affecting the day-to-day operation of the accounting system are contained in sizable handbooks which, from time to time, are up-dated and reprinted.²¹

The processing of data through the accounting system is undertaken by the staff of the book-keeping department. To assist them in the execution of this work the staff may well have the use of keyboard accounting machines and, additionally or alternatively, punched card accounting machines. The application of computers to accounting routines appears to be limited in terms of the number of computers in use, the degree of their effective utilisation and the range

of accounting tasks undertaken. However, as mentioned earlier, the Five-Year Plan for 1971-75 envisages a considerable increase in the number of business applications of computers.

The work of the book-keeping office falls into the two phases of:

- (1) current accounting or the daily recording of current transactions;
- (2) periodical closing or the monthly, quarterly and annual summarisation and reconciliation of the accounts, the compilation of the balance sheet and the accounting returns.

Structure of the Accounts

The standardised accounting system consists of a series of interlocking synthetical accounts, sub-accounts and analytical accounts prepared according to the principles of double-entry book-keeping (see Diagram 2). The synthetical accounts may be com-

²¹For example *Spravochnik Bukhgaltera Gosudarstvennoi Torgovli* (The Handbook for Book-keepers in State Trade), (Moscow, 1969), runs to over 600 pages.

Diagram 2: The Structure of Enterprise Accounts

| <i>Soviet Title</i> | <i>Nature of Account</i> | <i>Notes</i> |
|----------------------|--|---|
| Synthetical accounts | Main control accounts | } Specified by ministerial decree |
| Sub-accounts | Subsidiary control accounts | |
| Analytical accounts | Ledger accounts | |
| Operational accounts | Accounting records of production processes | Originated by the chief bookkeeper for overall accounting control |
| | | Originated by the supervisors for detailed accounting control |

pared to control accounts and the analytical accounts to ledger accounts. The intervening sub-accounts summarise the data contained in a particular group of analytical accounts (i.e. the sub-account is a control account for only part of a ledger) and the data in particular sub-accounts is summarised in the relevant synthetical account. The synthetical accounts are so called because their function is to synthesise the myriad detail of the activities of the enterprise whereas the analytical accounts provide a more detailed analysis of those activities. Analytical accounts (e.g. for each finished product, customer and so on and, in addition, for each employee of the enterprise) are opened in accordance with the requirements of the particular business but these accounts must be so grouped that their contents may be summarised ultimately in one or other of the approved synthetical accounts. For example, the synthetical account No. 60 Current Account with Supplies and Contractors, would be split down into a number of analytical accounts, one such account being opened for each supplier and contractor with whom the enterprise has business dealings. Synthetical, sub- and analytical accounts are described in Soviet accounting terminology as first, second and third order accounts respectively.

By ministerial decree the accounts plan specifies the synthetical accounts and sub-accounts which may be opened by the chief book-keeper. These are the major account headings comprising the central core of the system. With minor modifications to meet the requirements of particular branches of industry, the accounts plan is applied in all the basic units of micro-economic activity (i.e. enterprises, farms, institutions and organisations). Synthetical accounts and sub-accounts may not be opened other than in accordance with the plan of accounts as from time to time modified by decree.

These major account headings may be visualised as providing an interface between, for example, the enterprise and the supervising authority. Thus, using the synthetical accounts classification as a base-line, it is possible by a process of aggregation to summarise the accounting returns for different enterprises by

region, by industry and for the entire union. And similarly using the synthetical accounts classification as a base-line, it is possible to set up the complementary analytical accounts so as to provide a more detailed accounting separately for, and by, each enterprise.

These accounts are intended to meet the needs of both financial and cost accounting. In the synthetical accounts the classification of expenditure is not descriptive but functional. There are accounts for shops general outlays and works general outlays instead of for, say, electricity, rent, telephones and postage and so on. In other words, there is a common system of integrated accounts. The costs of production are accumulated through the accounts according to the principles of absorption costing. Direct or marginal costing is not employed. However, supplementary to the standardised accounting system and for the purpose of a more detailed accounting for the production and trading operations (and, in agricultural undertakings, for farming operations) there may be conducted operational accounting by means of which there is 'a classification of outlays according to shops, sections, brigades, types of products, divisions and in other ways'.²² That is, there is, or may be, a compilation of detailed accounting data for the costs and the associated physical consequences of the operations and services performed by the business in the course of the conversion of raw materials into finished products. In marked contrast to the book-keeping system there is not a standardised system of operational accounting. Instead, there appears to be considerable variation in the quality, sophistication and comprehensiveness of the operational accounting undertaken by different enterprises. 'This accounting is conducted by book-keepers, statisticians, foremen, dispatchers, and the workers of the planning, finance and other departments.'²³ It would appear that in many instances only memoranda records for the specific needs of particular aspects of operational

²²I. Basmanov, *Uchet Proizvodstvennykh Raskhodov Predpriyatiya* (Accounting for the Production Outlays of Enterprises), (Moscow, 1967). p. 15.

²³P. A. Kostyuk, *op. cit.*, pp. 85-86.

control are maintained, and that these records are divorced from the double-entry book-keeping system. By contrast, in the machine building industry there appears to be a well-developed system of operational accounting interlocked with the standardised accounting system. For example, in the enterprises of that industry the synthetical account No. 23 Ancillary Production may be further subdivided into a series of operational accounts for:

- 20 Capital repair of industrial buildings and installations;
- 21 Capital repair of mechanical equipment;
- 22 Capital repair of electrical equipment;
- 23 Capital repair of transport rolling stock;
- 24 Capital repair of dwellings;
- 25 Capital repair of cultural and social buildings.

The data in these accounts would be aggregated in the synthetical account 23 Ancillary Production – Capital Repair and the data in that account together with data in such analytical accounts as those for, say, production services (i.e. electricity, motor transport) and spare parts manufacture would be summarised in the synthetical account No. 23 Ancillary Production. In addition, there may be a further three digit code for individual items of cost. In this manner a seven digit cost classification is constructed. Consequently, there is provided the framework of a data base for the extraction of a great variety of *ad hoc* cost analyses, if it were to be required and provided there were either the manpower or technical means for its accomplishment.²⁴

It is in the sphere of operational accounting that the technique of normative accounting may be implemented whereby the norm and actual costs for specific tasks are compared and the cost deviation isolated. But unlike the customary practice of standard costing in capitalist firms there appears to be no attempt to carry out an analysis of cost deviations. The norm costs and cost deviations are confined to memoranda records and are not passed through the double-entry book-keeping accounts. Thus, the synthetical accounts are compiled on the basis of historical costs. However, Dembinskii has indicated how the deviation between the planned and actual costs of manufactured articles could be passed through the synthetical accounts.²⁵ Makarov, in the course of a discussion of the classification of accounts according to their purpose and structure, gave a diagrammatic display of typical synthetical accounts and included therein Deviations of Actual Cost from Planned Accounts.²⁶ However, he added a footnote that at the

present time such an account was not included with the synthetical accounts of enterprises. It would appear, therefore, that there is a body of accounting opinion which considers that norm costs, and the corresponding cost deviations, should be entered into the double entry accounts.

In the official schedule of synthetical accounts and sub-accounts the following eleven divisions for the grouping of the accounts are employed:

- (1) Fixed Assets;
- (2) Production Stocks;
- (3) Expenditure on Production;
- (4) Completed Output, Commodities and Realisation;
- (5) Monetary Resources;
- (6) Current Accounts;
- (7) Withdrawn Resources;
- (8) Shortage and Losses;
- (9) Funds and Reserves;
- (10) Bank Credit and Financing;
- (11) Financial Results.

Perhaps more usefully, the synthetical accounts may be subdivided into the two groups of:

- (1) accounts for the economic means and resources;
- (2) accounts for the economic processes and their results.

The distinction between these two groups rests upon the difference between

- (1) the resources entrusted to the enterprise and their means of financing at any given moment (reflected in the balance sheet);
- (2) the manipulation of those resources during a given period of time so as to produce goods and services (reflected in the book-keeping entries recording such activity).

From this latter point of view the synthetical accounts may be grouped according to the economic processes of:

- (1) procurement (i.e. of material inputs);
- (2) production;
- (3) realisation (i.e. of final inventories).

In the balance sheet prepared at the end of the accounting period there are shown all the assets which are the legal property of the enterprise and the concomitant liabilities, reserves and capital. But in addition there is prepared a supplementary list of final balances of all the other assets in the possession of the enterprise (e.g. the capital value of commodities held for sale on commission).

A flow diagram of one of the officially sanctioned systems for the recording of primary accounting data and the computation of the accounts of an enterprise is shown in Diagram 3.

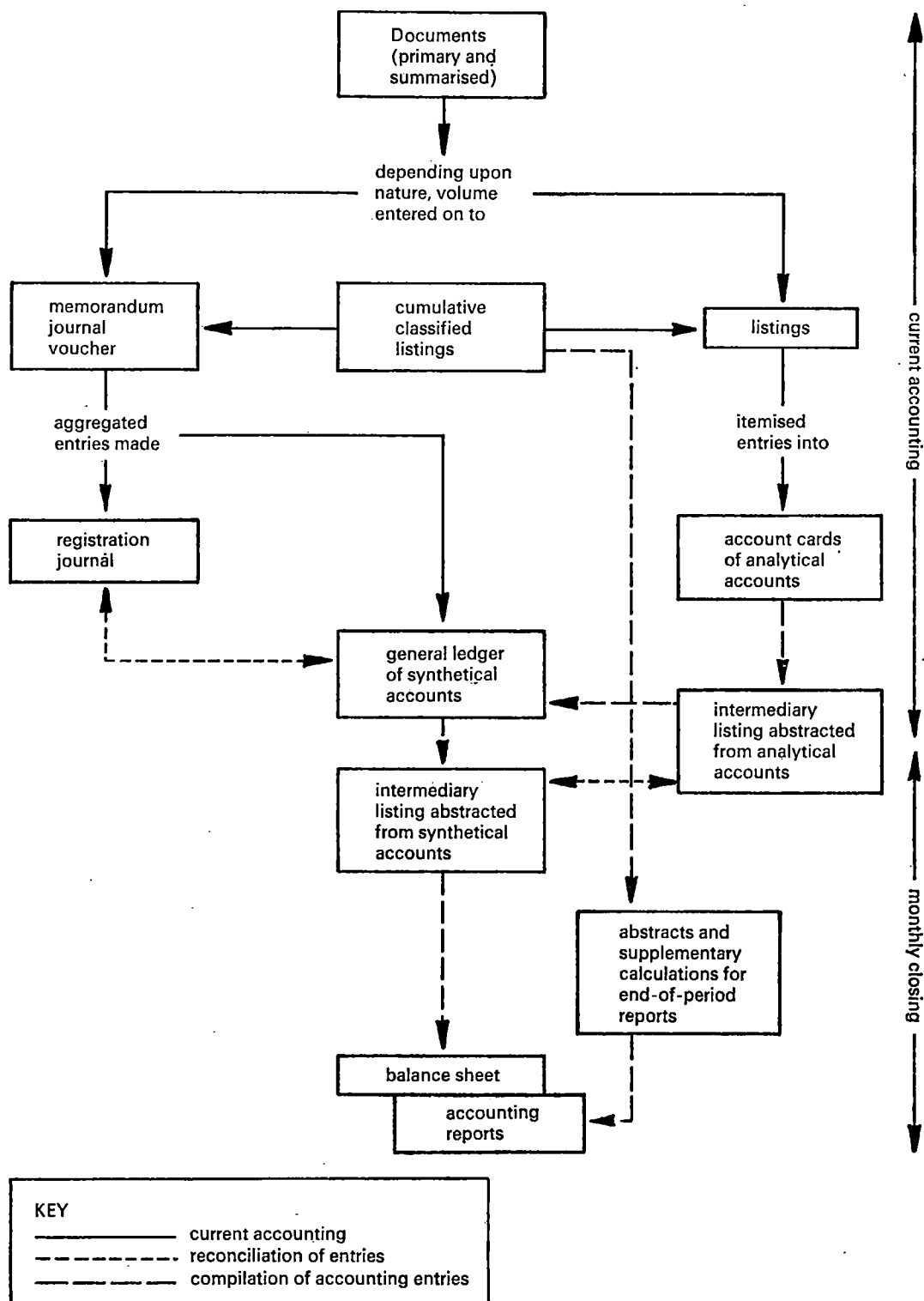
The function of the chief book-keeper appears to be primarily that of monitoring performance and

²⁴I. Basmanov, op. cit., pp. 15–19.

²⁵N. V. Dembinskii, op. cit., ch. IV.

²⁶V. G. Makarov, op. cit., p. 172.

Diagram 3 The Journal Voucher System of Enterprise Book-keeping



SOURCE: V. G. Makarov, *Teoriya Bukhgalterskogo Ucheta* (The Theory of Book-keeping) (Moscow, 1966) p. 272.

providing a stream of summarised data to the various supervising authorities. Emphasis is placed upon the timely submission of the monthly, quarterly and annual accounting returns to these authorities, who are empowered to request supplementary information. In their turn the immediately supervising organs, on the basis of an appraisal of the returns submitted, evaluate the results of the subordinate enterprises and draw up summarised reports for submission to their superiors. The book-keeping function of the enterprise may be visualised as an integral part of a self-regulating feed-back system, as is indicated in Diagram 4.

The remaining major component part of enterprise accounting is statistical calculation. Some of the raw data for the calculation of control statistics may be derived from the primary documents utilised in the book-keeping system and in operational accounting, although it would appear that a substantial volume of raw data is independently collected by means of a separate system of documentation prescribed by the Central Statistical Administration. The raw data is used to compile statistics relating to the composition of the labour force, labour productivity, volume of production and other control statistics required by the supervising authorities. The majority of these statistics are expressed in a non-monetary form. Returns of statistical data are submitted to the supervising authorities at the end of each ten-day period. In a similar manner to the accounting data contained in the synthetical accounts the control statistics are aggregated by industry and for the entire country.

Vasilenko emphasises the major role of statistical calculation. 'Statistical data is used not only for the purposes of current planning, guidance and control, but also serves as the basis for the computation of the perspective plan, the correct planned construction and development of the entire socialist economy.'²⁷ And, he concludes, it is for these reasons that, from among the various forms of record keeping, including accounting, undertaken by the enterprise the leading position is occupied by statistical work.

It is on this basis that there has been developed a unified system of national economic accounting extending to all units of micro- and macro-economic activity complementing the system of national economic planning; so that while the latter maps out the economic goals of society the former measures the extent of their realisation. In the words of Dembinskii 'the separate aspects of national economic accounting are complementary to one another, are constructed on a unified methodological foundation, and are realised through a unified system

of socialist national economic data processing' whereby 'all aspects of economic data processing are organised in the interests of the national economy as a whole, in the interests of the creation of a scientifically validated system of indicators providing a comprehensive monitoring of the processes of extended socialist reproduction.'²⁸

Because the accounting data of units of micro-economic activity are aggregated to produce the national accounts enterprise book-keeping is considered an integral part of national economic accounting and, as Dembinskii has stated, 'the theory of Soviet book-keeping is a branch of the economic science of the socialist economy.'²⁹

4. Accounting for cost

Introduction

The manner in which the production costs are structured according to the Soviet system of enterprise accounting may be illustrated as shown in Diagram 5.

To production cost are added non-production expenses and turnover tax in order to obtain total cost. A convenient way to distinguish between production cost and total cost is to identify the former with all those cost items debited to the Completed Output Account and the latter with all those cost items, inclusive of production cost, that are debited to the Realisation Account. In addition some costs (e.g. destruction of stock by fire) are taken directly to the Profits and Losses Account.

Direct Production Outlays

The direct production outlays are classified into two primary groups. These groups comprise:

- (1) basic production outlays;
- (2) auxiliary production outlays.

The basic production outlays include those costs directly associated with the manufacture of one or other of the products forming part of the basic production range of the given enterprise. Included are the wages of production workers and outlays on raw and processed materials consumed in the course of production. These costs are collected into the debit of the Basic Production Account. Into the subsidiary analytical and operational accounts are assembled the corresponding costs for various types of products and manufacturing operations, respectively, and it is the global total of these costs that is reflected in the synthetical account for basic production.

²⁷P. N. Vasilenko, op. cit., p. 14.

²⁸N. V. Dembinskii, op. cit., pp. 26-27.

²⁹N. V. Dembinskii, op. loc.

Diagram 4 The Relation of Enterprise Book-keeping to State Planning

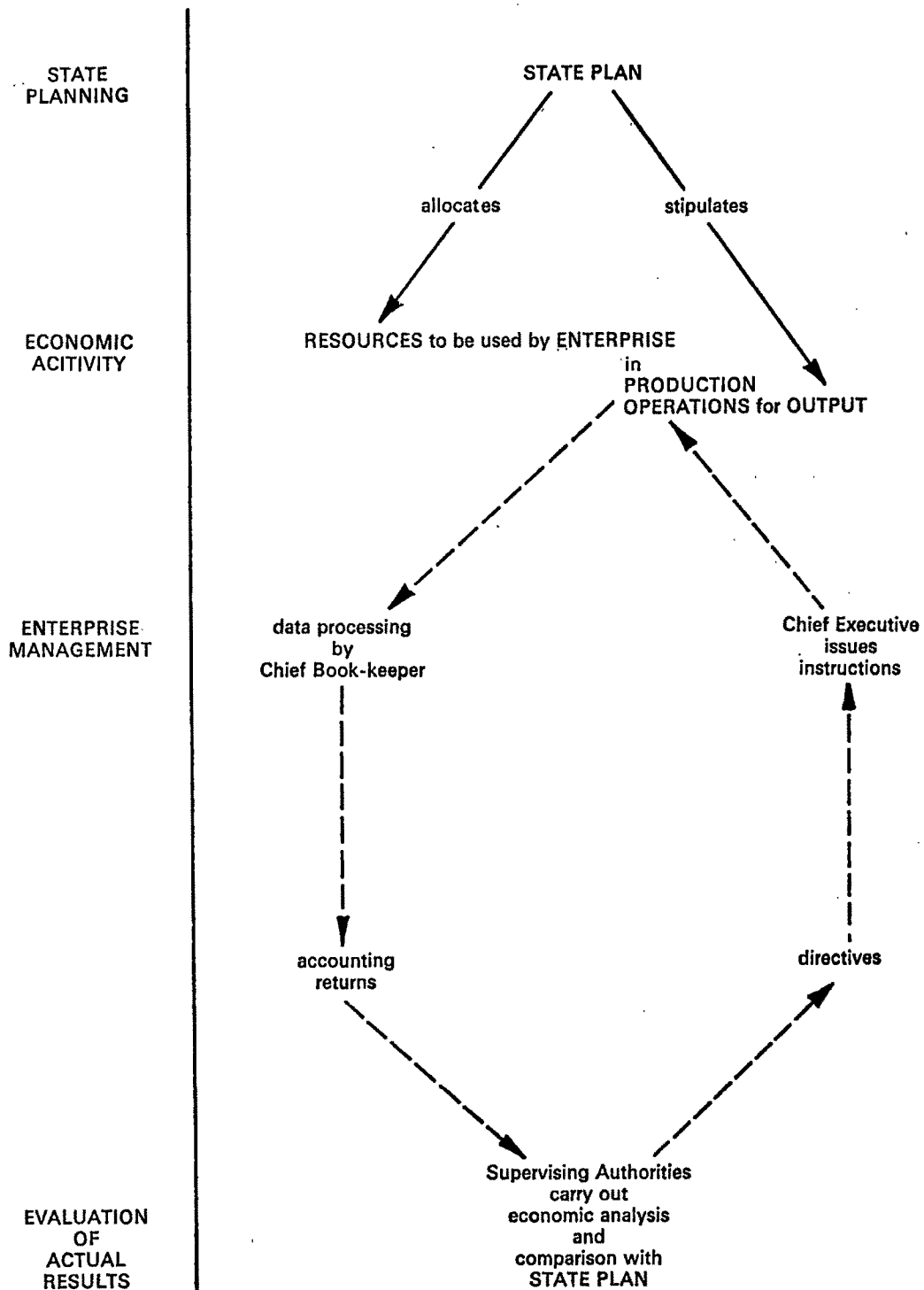


Diagram 5: Production Cost Structure

| | | |
|---------|--|-----------------------------|
| Basic | Basic Production Outlays | Direct Production Outlays |
| | Auxiliary Production Outlays | |
| | Maintenance and Utilisation of Equipment | Indirect Production Outlays |
| Loading | Shops General Expenses | |
| | Works General Expenses | |

The second group comprises the auxiliary production outlays. Auxiliary production refers to those production services intended to facilitate the basic manufacturing processes such as transport of incoming freight, repair work, the provision of water, steam and electric power. Although the production shops are the principal consumers of these services, some part of the utilities output may be supplied to third parties. The costs directly associated with these services are gathered into the debit of the Auxiliary Production Account. The costs of the utility services are charged to the user departments (i.e. to the basic production shops and to the accounts for shops general and works general expenses) by means of cost rates (e.g. for units of steam, electric power, etc., provided) designed to recoup all the costs incurred. The other production services, such as repair work, are charged to the user department on an actual cost basis. Usually the distribution of costs to the user departments does not occur until the end of the monthly accounting period.

In the Auxiliary Production Account there are accumulated also the costs for:

- (1) the manufacture of production tools;
- (2) the manufacture of subsidiary products;
- (3) services in connection with the dispatch of goods to customers (i.e. presumably, packing costs).

Subsequently, all these costs are transferred to the appropriate accounts: that is, Production Tools Accounts, Completed Output Account, and Commodities Dispatched Account respectively. The synthetical account for auxiliary production may be complemented by a series of operational accounts in which are accumulated the costs for different kinds of auxiliary production. At the end of the accounting period the closing balance on the synthetical account represents the cost of uncompleted work on hand in the tool-room, mechanical repair and other workshops providing production services.

Indirect Production Outlays

The indirect production outlays consist of those

costs which cannot be directly associated with the manufacture of specific types of products. These costs fall under the two general headings of:

- (1) outlays for the maintenance and utilisation of equipment;
- (2) outlays for the management and servicing of production.

The first group includes the costs for the maintenance, current repairs and depreciation of the production machinery. These costs are collected into the debit of the Maintenance and Utilisation of Equipment Outlays Account and subsequently transferred to Basic Production Account. Simultaneously, through the mechanism of the complementary operational accounts, an appropriate proportion of these costs is added to the costs already accumulated for the individual types of products. The method by which this is done appears to vary as between different branches of industry. As an example, the method approved for the enterprises of the machine construction and metal-working industries stipulates the use of estimated, or normative, cost rates.

The second group of indirect production outlays is also known as the 'loading' outlays. These outlays comprise the remuneration of the managerial and administrative personnel, the maintenance of buildings and business administration installations (e.g. punched-card accounting equipment) and outlays for such purposes as the running of the office and communications. These costs are collected into one or other of two analytical accounts entitled Shops General Outlays Account and Works General Outlays Account.

In the former account are gathered those outlays which may be directly associated with individual shops of the enterprise. This category of costs embraces such items as the remuneration of the shop personnel (i.e. those individuals not directly engaged on production), maintenance, current repairs and depreciation of the buildings and structures of the shops, as well as the wear and tear of production tools. Also included are some items of a non-productive character such as losses occasioned by delays and the deteriora-

tion of items held in the shop store.

In the latter account are collected the outlays consonant with the total economic activity of the enterprise. This group of costs embraces the remuneration of the managerial and administrative personnel and other general business personnel, the maintenance, current repairs and depreciation of the fixed assets of a general works nature and the outlays for labour protection. In addition, there are included some non-productive outlays and miscellaneous payments to third parties (e.g. local taxes and duties, damages exacted by court order to compensate for damage done by the workers of the enterprise).

At the end of the accounting period the aggregated shops general and works general expenditures are transferred to one or other of the production accounts. Simultaneously, by means of the analytical and operational accounts, a proportion of these expenditures is included in the costs of the various types of products. For this purpose there may be constructed cost rates calculated on one or other of the following bases:

- (a) the wages of production workers;
- (b) the value of processed materials consumed;
- (c) the volume of completed work;
- (d) estimated, or normative, rate based on machine hour coefficients.

Non-Productive Outlays

Non-productive outlays is a general term embracing those costs considered not to have been properly incurred during the process of manufacture but, instead, to be attributable to business organisational deficiencies. Included are the losses occasioned by delays, damaged products, deterioration of stocks and through the breach of contractual obligations (e.g. interest on overdue loans, penalties for late delivery or incorrect execution of contracts with customers). The general term also covers losses attributable to natural, rather than business organisational, causes such as the loss of processed materials and output through fire or flood. These losses, depending upon the attributable cause, may be debited to any of Shops General Outlays Account, Works General Outlays Account and Profits and Losses Accounts.

Other Production Costs

Depreciation of the basic means of production is provided in accordance with the ministerial decrees which usually determine that the annual depreciation deductions be calculated as a stipulated percentage of the initial cost, or revaluation, of specified fixed assets. Every month an equal part of the annual deduction is credited to the Depreciation Fund Account and, depending upon the purpose for which

the basic means are being utilised, the corresponding debit to one or other of Auxiliary Production Account, Shops General Outlays Account or Works General Outlays Account.

Another important account is the Spoilage in Production Account. To this account is debited the cost of that output which has failed to pass inspection and added thereto is the expenditure incurred on its rectification. The credit entries to the account are in respect of the cost of re-usable components returned to the store and the amounts recovered from those persons held responsible for spoilage. The loss remaining on the account is written back to the Basic Production Account.

In the outlays for Future Periods Account are accumulated those costs properly chargeable against revenue although not attributable solely to the current accounting period but, instead, to a number of consecutive accounting periods. Such costs include:

- (a) outlays for mastering new types of products;
- (b) outlays for the experimentation, investigation and rationalisation measures of local importance;
- (c) advanced payments of rental for leased assets;
- (d) subscriptions for periodical publications;
- (e) some kinds of current repairs.

In accordance with the nature of the particular kinds of outlays that have been incurred for a specified number of consecutive accounting periods fixed instalments are transferred to the debit to one or other of the Basic Production Account, Shops General Outlays Account and Works General Outlays Account.

For anticipated forthcoming payments which are either lumpy or erratic in their occurrence, such as

- (1) holiday pay;
 - (2) liabilities arising from sales under guarantee;
- there is built up in anticipation a provision in the Reserves for Forthcoming Outlays and Payments Account.

The provision against holiday pay is built up by periodically debiting the production accounts with amounts calculated as a specified percentage of the wages paid. The reason for creating such provision is to lessen the impact of such lumpy or erratically incurred outlays on the financial results of the enterprise. Soviet accounting practice does not maintain a distinction between provisions and reserves.

Realisation

When the manufactured products have passed inspection and been received into the finished goods store the accumulated production costs for those products is transferred to the debit of the Completed Output Account. This transfer of costs is made in two parts in that the planned cost and the cost deviation (i.e. the difference between planned and actual cost)

are transferred separately but simultaneously.

Upon the products being consigned to the customer the appropriate costs, (i.e. the planned cost and the cost deviation) are transferred to the Commodities Dispatched Account. Packaging costs are also debited to this account.

Generally, a sale is not considered to have been realised until the documents demanding payment are presented to Gosbank. It is at this moment that the enterprise becomes liable for turnover tax. At the same time the accumulated costs are transferred to the Realisation Account and the turnover tax liability is also debited to the account. The corresponding credit entry for this last item is to the State Budget Current Account.

During the course of the financial year certain outlays and transfer payments not so far considered are accumulated in the Non-Production Account. This group of items includes:

- (1) outlays of the finished goods store;
- (2) outlays for the realisation of products (i.e. packing and delivery costs);

and contributions for:

- (3) the training of key personnel;
- (4) scientific and investigation work;
- (5) the upkeep of the apparatus of higher organisations;
- (6) bonus awards to workers for perfecting and introducing new techniques;
- (7) fund for the assimilation of new techniques.

At the termination of the accounting year the non-production outlays are debited to the Realisation Account. At the same time, through the operational accounts, these costs are apportioned between the various types of products sold in accordance with the approved method, such as in proportion to the production cost.

The sales value of the commodities realised is credited to the Realisation Account and at the close of the year the balance on the account is transferred to the Profit and Losses Account.

The accounting entries for the production and sale of products are illustrated in the Appendix.

5. Accounting for cash flow

Apart from the petty working balances of cash all monies belonging to the enterprise must be lodged with the State Bank. The settlement of indebtedness between enterprises is usually carried out by a cashless clearance through the State Bank within a relatively short time of the acceptance of the goods or services. A cashless clearance is virtually an appropriate adjustment to the balances of the parties in the accounts kept at the State Bank. This institution is

enabled thereby to exercise a close surveillance over the financial affairs of the enterprise and, in particular, a close supervision of the cash movement.

The cash flow, the difference between the sales receipts and cash outlays for labour, materials and bought-in services, is not freely disposable by the chief executive of the enterprise but, instead, is appropriated for various designated purposes (see Diagram 6).

For example, part of the cash flow is withdrawn as a contribution towards the running costs incurred by the supervising industrial ministry in:

- (1) the training of key personnel;
- (2) scientific and investigation work;
- (3) the upkeep of the apparatus of the supervising organs.

And part of the net revenue of the enterprise is transferred to the state budget in the form of:

- (1) social insurance contributions;
- (2) turnover tax.

The amounts accumulated into the Depreciation Fund Account are treated as funds set aside for re-investment in the replacement of existing assets, or the acquisition of other assets, within the enterprises of a particular industry. Additionally, these funds may be used for the capital repair of the old assets, in respect of which the depreciation has been accumulated, or, when it is economically expedient, in the acquisition of new equipment. To this end, the depreciation fund accumulations are segregated into two parts for:

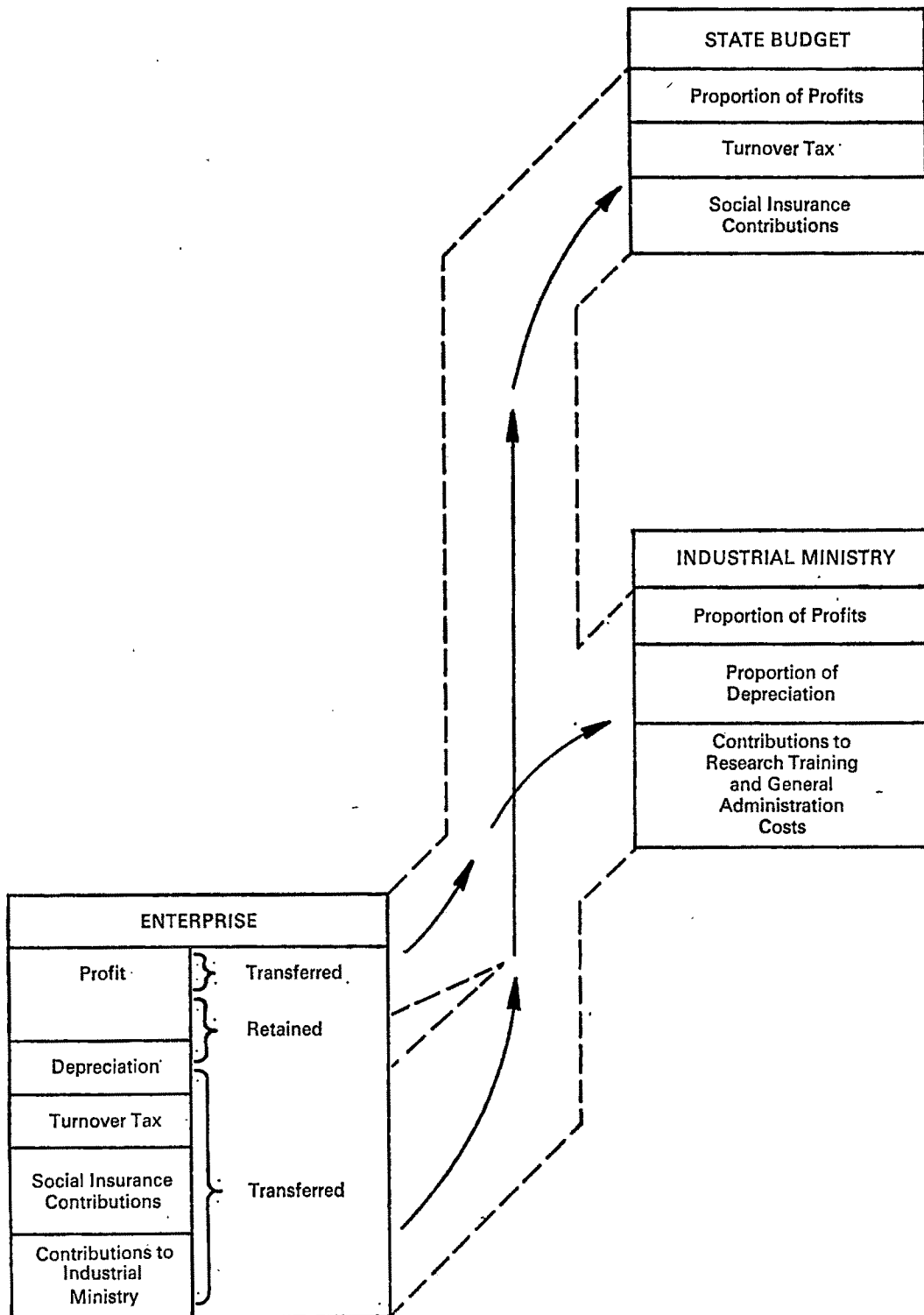
- (1) capital investment;
- (2) capital repair.

The former part is remitted to the Stroibank (i.e. the investment bank of the USSR) for the financing of centrally administered capital investment. The latter part is held by the State Bank in a separate account and, with the Bank's approval, may be drawn upon by the enterprise for either capital repair purposes or the purchase of new equipment.

As a consequence of these demands for transfer payments placed upon the net revenues of the enterprise an apparently loss-making enterprise is not necessarily a net receiver of state finance. That is, a loss-incurring undertaking may be making some contribution towards the overhead costs of society, towards the cost of the superstructure of the state administrative machinery.

During the course of the accounting year, and in respect of the planned profits, periodical debits are made to the Appropriated Profits Account and corresponding credits to the State Budget Current Account, for payments into the state budget, and to the Economic Stimulation and Other Special Purpose Funds Account for profits appropriated into the material incentives, housing construction and social-

Diagram 6 Appropriation of the Cash Flow of the Enterprise



cultural funds of the enterprise as well as for the payment of bonuses to workers participating in socialist competition to increase production. Because these periodical transfers are in respect of planned, and not realised, profit and the payments into the state budget are obligatory, an enterprise unable to achieve the planned level of profits will be obliged to seek financial assistance from the State Bank. The close financial oversight of the enterprise undertaken by the State Bank ensures that there is a close correspondence between the level of profits earned and the changes in the bank balance. Consequently, the State Bank is likely to be fairly quickly alerted to any financial difficulties being experienced by an enterprise.

At the end of the accounting year the Appropriated Profits Account is closed to the Profits and Losses Account. Into the latter account are entered:

- (1) profits and losses on the realisation of commodities;
- (2) losses occasioned by such natural disasters as fire and flood (e.g. damaged or destroyed stocks);
- (3) losses arising on the liquidation of fixed assets fully depreciated;
- (4) irrecoverable debts;
- (5) penalties and fines received or paid.

Apart from the purposes already mentioned,

planned profits may be used for:

- (1) financing capital investment;
- (2) investment in circulating assets;
- (3) repayment of bank loans.

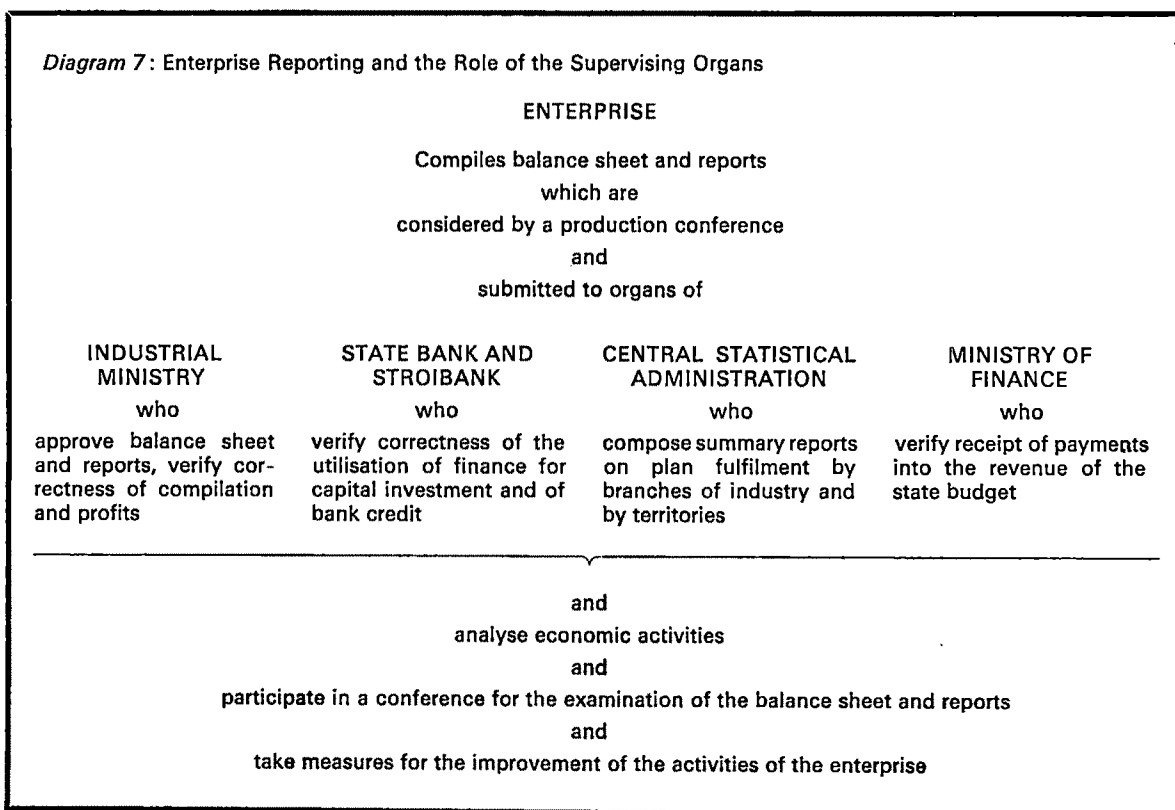
From an examination of the financial results of the enterprises' activities at the end of the year the supervising authorities decide upon the disposition of the over-plan profits (see Diagram 7). These profits may be applied in making:

- (1) contributions to the housing construction fund;
- (2) contributions to the enterprise fund;
- (3) payment of bonuses for socialist emulation;
- (4) repayment of bank loans;
- (5) payments into the fund of the supervising industrial ministry;
- (6) payments into the state budget.

The balance of unappropriated profit retained by the enterprise remaining on the Profits and Losses Account is transferred to the Statutory Fund Account.³⁰ The Profits and Losses Account is closed, but the account is re-opened anew on the first day of the next accounting year.

³⁰The balance of the Statutory Fund Account is equivalent to the equity capital of the capitalist firm.

Diagram 7: Enterprise Reporting and the Role of the Supervising Organs



SOURCE: L. Gringarten, *Al'bom Naglyadnykh Posobii po Bukhgalterskomu Uchetu v Promyshlennosti i Stroitel'stve* (Album of Visual Aids for Book-keeping in Industry and Construction) (Moscow, 1966) p. 94.

6. Summary

This paper has attempted to give an exposition of the form of accounting practised in the enterprises of the USSR.

It has been shown that there has developed a highly structured system of standardised accounting for application in industrial, commercial and agricultural undertakings. The accounting system is meshed into the state planning mechanism. Incidentally, it is interesting to note the recent observation by Most that French officials have 'a widely held belief . . . that accounting does have a significant role to play in the economic development of the modern state'.³¹ In common with the pre-war German system, the Soviet system is 'designed to operate in a controlled economy where most of the tests of economic efficiency incorporated in a free market economy' are 'absent'.³² Like that system, too, it may be ventured that the Soviet system 'may be said to owe its origins to the desire to consolidate control . . . for reasons of public economy and fiscal considerations, rather than to further the interests of the individual undertaking'.³³ This fact is underlined by the relative under-development of accounting techniques for the analysis of the cost of production processes. The

system facilitates the aggregation of micro-economic data, and a monitoring of the activities of the enterprises by the supervising organs of the industrial ministries, the Ministry of Finance and the State Bank. It has been suggested that the system may have facilitated the introduction of the Economic Reform of 1965 by acting as a centralising constraint on any centrifugal tendencies that may have been generated by the devolution of some economic powers to the enterprises, and that the accounting system facilitates the development of the proposed all-union system of computer-based data processing.

In the integrated accounts the product costs are accumulated according to historical absorption costing principles although in the supplementary operational accounting records a relatively unsophisticated system of standard costing, known as normative costing, may be employed.

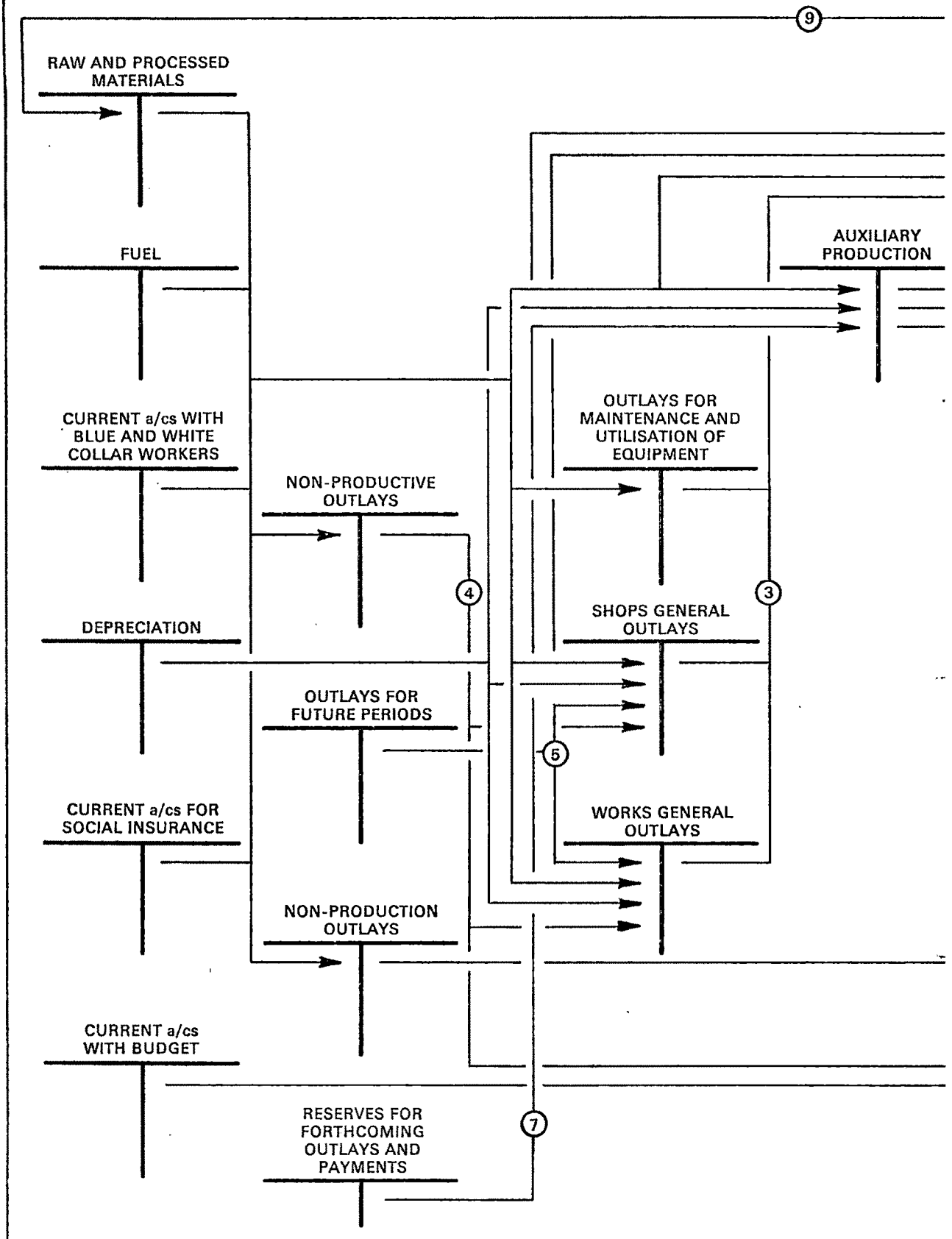
Compared with the standardised accounting systems of pre-1939 Germany, contemporary France and the European socialist countries the Soviet model is the most ambitious in that it is being applied to the economy of the second industrial power of the world. That the Soviet experience has excited little interest among the accounting profession of the capitalist countries is not surprising, although less so is the lack of interest shown by scholars. Consequently, this paper has been confined to an overall survey of the system, although the Soviet model, like the other implemented versions of standardised accounting systems, merits a thorough study.

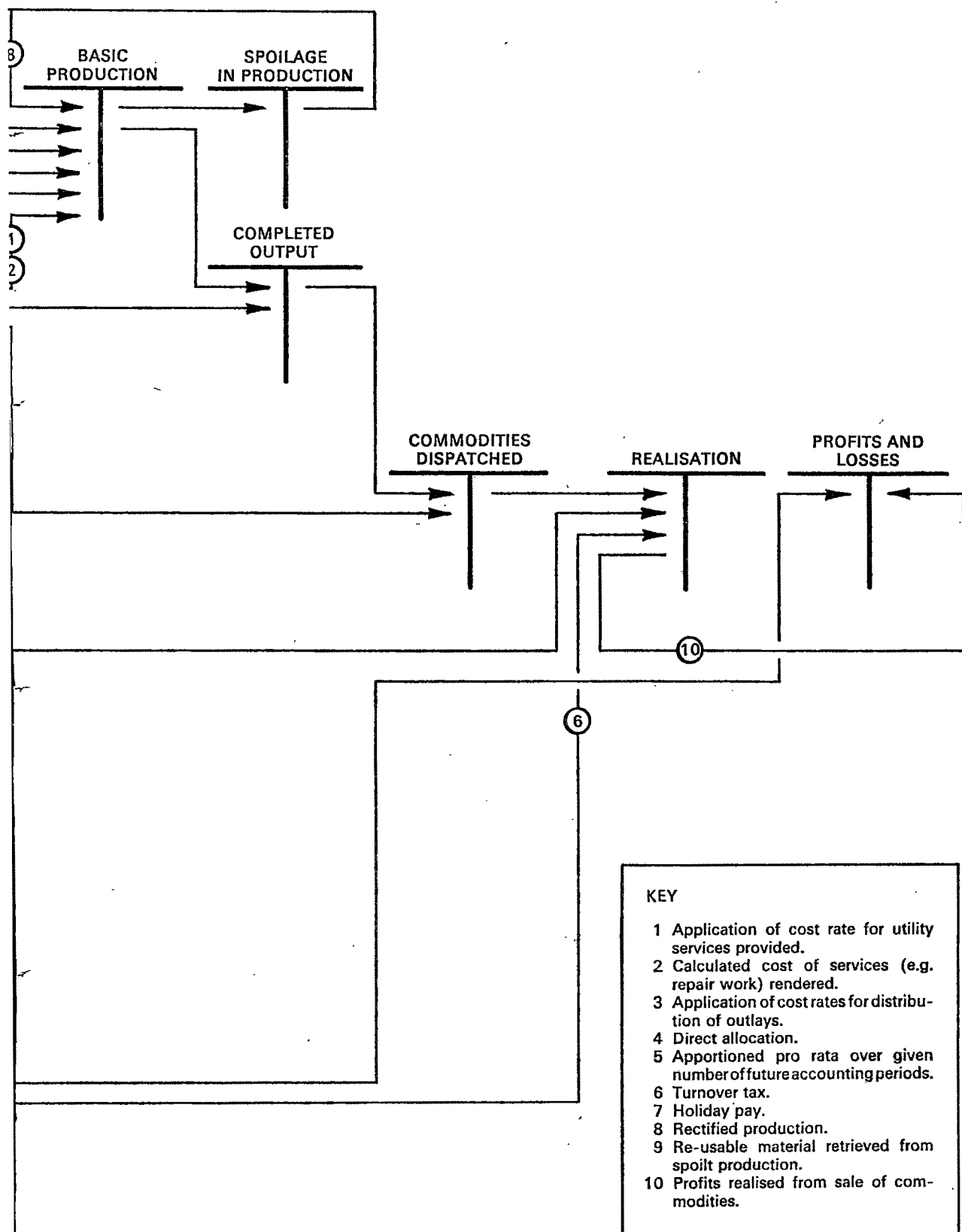
³¹K. S. Most, 'The French Accounting Experience', *The International Journal of Accounting*, Vol. 7, Fall 1971, p. 15.

³²R. Abel, 'The Impact of Environment on Accounting Practices: Germany in the Thirties', *The International Journal of Accounting Education and Research*, Fall, 1971, p. 29.

³³H. W. Singer, *op. cit.*, p. 10.

APPENDIX FLOW DIAGRAM OF ACCOUNTING ENTRIES





Auditing Standards

Bruce G. Picking

1. Introduction

This paper is concerned with the standards of auditing currently applicable in the United Kingdom. It is not primarily concerned with criticising or defending the existing situation but rather with attempting to suggest what the situation ideally should be. This is an important distinction in my view, and one which on occasion has not been made by the accounting bodies in the United Kingdom and the United States in their various opinions and statements issued for the guidance of their members.

Neither is this paper concerned with prescribing a detailed inventory of auditing procedures for application as a matter of course in the endless variety of situations with which the auditor is faced. Such standardisation of auditing is undesirable since it eliminates the exercise of professional judgement without which auditing becomes a mechanical task of little value to any of the parties concerned. Before proceeding further it is therefore necessary to define what I understand by the term 'auditing standards'. The Oxford Dictionary definition of a standard is a 'specification by which the qualities required of something may be tested; required degree of some quality.' It is in that sense that I use the word here and that sense which enables a clear distinction to be drawn between auditing standards and auditing procedures as has been done by the American Institute of Certified Public Accountants which has stated that:

'Auditing standards differ from auditing procedures in that "procedures" relate to acts to be performed, whereas "standards" deal with measures of the quality of the performance of those acts and the objectives to be attained by the use of the procedures undertaken.'¹

Standards of auditing remain the same from audit

to audit while procedures change to suit the circumstances. What must be guarded against, if confidence in public accounting is to be prevented from waning, is a change in standards to suit the circumstances while auditing procedures remain the same in every case.

The accounting profession has been under heavy fire of late and while steps are currently being taken to establish standard accounting practices, a development on which I pass no comment, little has yet been done to lay down auditing standards, perhaps reflecting the reasoning of one eminent historian of the English Institute, who states that:

'Up till that date (1942) the Council had hesitated to issue views on technical subjects lest they should be resented by members – and lest standards might come to be set which might on occasion be embarrassing to individuals.'²

Since 1942 the Council has fortunately seen fit to spread resentment and embarrassment among its members and I suggest that a little more of these two emotions would not cause too much harm and might even do some good. A delineation of the standards of auditing which are to be expected from members of the English Institute is long overdue not only in order to keep members on their toes, but also to inform the public and increase their confidence in the auditing function. If the profession is not seen to put its own house in order then, rightly or wrongly, pressure is likely to be brought to bear on the government to help improve matters, either through legislation or the removal of the auditing function from the private sector and its replacement by government auditors, a development which I for one do not view with relish.

A clear statement that an audit has been made in accordance with accepted standards which have

¹'Codification of Auditing Standards and Procedures', Statement on Auditing Standards No. 1 at page 4, Auditing Standards Executive Committee of the AICPA (1973).

²'The History of the Institute of Chartered Accountants in England and Wales 1870–1965' at page 195, Sir Harold Howitt (1966).

been reduced to writing for the benefit of interested parties is, I feel, a step in the right direction so far as the future of the public accountant in the United Kingdom is concerned.

2. Deducing standards from objectives

It should be logically possible to deduce a tenable set of auditing standards by considering the objectives of an audit examination of the accounts of a company. This approach seems preferable to considering a list of possible candidates and arbitrarily choosing those which have some intuitive appeal for inclusion. Unless one has reasonably clearly defined objectives, one has no supportable criteria of choice. Unfortunately it is extremely difficult to be objective in these matters and having seen the American attempt at stating auditing standards, with which I am generally in agreement, it becomes difficult to prevent bias from creeping into one's appeals to reason. However the exercise should at least give some support to the inherent reasonableness which pervades the American attempt, which is discussed much more fully later in this paper.

The primary objective of an audit is the expression of an opinion on the accounting statements under examination, which for convenience rather than any other reason are assumed to be the balance sheet and profit and loss account of a company registered under the various Companies Acts. The precise nature of the report made by the auditor will be considered at a later juncture as part of the discussion of reporting standards. Suffice it to say at this stage that the auditor is concerned with truth and fairness, but with a highly specialised meaning attached to those words, although one does not doubt that many a present day auditor still justifies the use of the following words, taken from an epitaph in 1626, to describe his calling:

'Here lyeth part of Richard Bowle who faithfully served diverse great lords as auditor on earth, but above all he prepared himself to give up his account to the Lord of Heaven, and now hath his "quietus est" and rests from his torments and labours. He was a lover of God's ministers, a father of God's poor, a help to all God's people, and believes that his flesh, which with the soul was long tormented, shall with the same soul be eternally glorified.'³

The objectives of the audits which poor Richard Bowle undertook were not the same in many respects as those of today's audits and the procedures employed are certainly very different. It is interesting to note

however that the concern with a true and fair view of the company's affairs and operations so far as the shareholders are concerned is not of universal application even today; for example, in Sweden and Germany much less emphasis is placed on this aspect of the auditor's duties.⁴ The Companies Act of 1900 required the audit of the accounts of United Kingdom companies and reference was made in the auditor's report to 'a true and correct view of the state of the company's affairs'. Dicksee, writing in 1902, does not stress the importance of reporting to the shareholders as the primary purpose of an audit, but states that the objects of an audit are threefold – the detection of fraud, technical errors and errors of principle.⁵ One is tempted to ask to what end this detective activity is being undertaken, and in fairness no doubt some concept of shareholder protection and information underlies much of what Dicksee writes.

The assertion that the expression of an opinion as to the truth and fairness of a set of accounts is the primary objective of an audit requires further examination. What comfort does the appearance of an auditor's report with the published accounts of a company give to the readers of those accounts? I hasten to add at this stage that the information content of the accounts themselves is not under discussion, and, although the value of the auditor's opinion can obviously be impaired if the accounts with which it appears are themselves of limited value to the reader, the point at issue is whether or not the presence of an auditor's report in any way enhances the utility of the published accounts to their reader.

The role of the auditor is to increase the degree of reliance which the readers of accounts feel they can place on those accounts. Particularly where the shareholders are concerned there is a need for some assessment of the reliance which may be placed on the otherwise unsupported assertions of management and directors contained in the annual accounts. In the absence of certain standards of auditing, which are both adequate in theory and enforceable in practice, however, the auditor's report is of little value, since it merely shows that someone is prepared to sign a piece of paper with perhaps little regard for the consequences.

The above discussion should enable certain auditing standards to be deduced from the basic proposition that whatever increases the reliance of the public, and

⁴For a review of auditing in various European countries see 'Record of Proceedings – European Congress of Accountants 1963', Business Session III. Auditing – the ways in which the professional responsibilities of the auditor are discharged in the context of the obligations imposed on him in various countries. ICA of Scotland (1964).

⁵'Auditing', Fifth edition at page 7, Lawrence R. Dicksee (1902).

³'History of Accounting and Accountants' at page 88, Richard Brown (1905).

in particular investors, in the auditor's report is a desirable feature or standard against which to judge the auditor. These standards fall conveniently into four categories which I have labelled 'competence', 'independence', 'performance', and 'reporting'.

The person examining financial statements must be competent to do so. This competence is most apparent if he holds a recognized professional qualification. The public are then at least assured that the profession of which the auditor is a member is itself satisfied that he possesses the necessary degree of competence. For the professional qualification to have any real value however it must ensure that those who possess it have received an adequate training in both the theory and the practice of their chosen profession, or, more usually nowadays, their chosen specialisation within that profession.

Having ascertained that the auditor is competent to perform his task, those who appoint him must also attempt to ensure that he will give an honest and unbiased opinion of the accounts which he has examined. In the United Kingdom the shareholders will usually appoint the auditor, which seems the preferable arrangement, and his duty is to them. The shareholders are anxious to ensure that the auditor is not unduly influenced by the wishes of management or his own personal interests in the company in conducting his audit. The accounts are the representations of management upon which the auditor is asked to express his independent opinion. How is an independent attitude to the auditors' task to be guaranteed? A standard of independence means little if it cannot be adequately defined or enforced. There are those who contend that independence is a state of mind and cannot be defined unequivocally in terms of situations in which the auditor is deemed to be independent or to sacrifice this independence. It seems necessary however to define relationships in which the auditor is automatically disqualified from acting or, less strongly, is *prima facie* regarded as having sacrificed his independence. Such situations would include being an officer of the company being audited or having a financial interest in the company in the form of shares or debentures. A more difficult situation arises where the auditor, usually through other members and employees of his firm, provides other accounting services to the company which he is called upon to audit. For example, the provision of management consultancy services can create a situation where the need for independence in the auditor's approach becomes of vital importance. The auditor must not allow the fact that a major data processing system has been installed by his colleagues to influence his critical and independent approach to the performance of the annual audit.

Even if the auditor is both competent and independent there is no guarantee that he will perform his job properly in the absence of adequate standards of performance. Legal remedies are available against the auditor who is negligent in the performance of his duties and as a professional man who provides services for payment he must exercise due care in conducting the audit. Arising from the rather vague concept of due care and the fact that audits of large companies can often be complex affairs further standards of performance can be suggested.

If an efficient and satisfactory audit is to be achieved the work to be done must be planned in advance and closely supervised. The auditor should not sign his report unless he is satisfied that adequate work has been properly performed. What constitutes adequate work will of course depend upon the circumstances of each case but the importance of a proper evaluation of the internal control features of a client's accounting systems cannot be over-emphasised. The auditor's assessment of the internal control features of his client's systems determines the extent of the tests he will make of the items appearing in the financial statements. The informed shareholder would presumably therefore wish that proper evaluation of internal control should be regarded as an auditing standard which has to be met if a proper audit is to be performed.

The audit is essentially based on the gathering of evidence which the auditor uses in forming his opinion on the accounts under examination. This evidence may be gathered in various ways – by confirmation with third parties, vouching of documentation supporting a transaction, discussion with management, etc. – but if an opinion is to be capable of proper support then sufficient evidence of a suitable nature must be obtained. I would further suggest that all evidence be reduced to writing in the form of audit working papers which facilitate review of audit work by the various echelons within the accounting firm and also provide concrete evidence, suitable for production in a court of law, of the standard of work performed. The preparation of adequate working papers should be regarded as an auditing standard.

The only visible product of the audit so far as the reader of published accounts is concerned is the auditor's report. The standards relating to the content of this report are therefore extremely important. Basically the auditor must report what he has done and what his opinion is on the accounts as a result of this work. The first standard of reporting should therefore be that the documents examined are clearly identified, any restrictions of a material nature on the scope of the audit are clearly identified,

and, most importantly, a positive statement should be made by the auditor that his examination has been made in accordance with accepted auditing standards, which we are here seeking to define. This latter representation of fact could be made the basis of legal or professional disciplinary action, if it could be proved that auditing standards have not been complied with by the auditor.

The second standard of reporting should require the auditor to clearly state his opinion and, where the opinion is adverse or qualified or no opinion can be given, full details should be given of the reasons therefore. Thirdly, the wording of the basic 'clean' opinion must be considered. The reader of the accounts wishes to know if they have been prepared in an acceptable manner so far as the auditor is concerned and whether this year's accounts can be compared with those of preceding years. The reader however probably does not appreciate the limitations of the conventions employed in the valuation of assets and liabilities appearing in published accounts. 'Fairness of presentation in accordance with accepted accounting conventions' might be preferable to an unqualified 'true and fair view' in imparting the true nature of the auditor's opinion. Fairness of course does not only relate to the figures in the accounts but also their description, classification and related disclosures by way of note. The auditor must be satisfied that both the facts and figures are adequate to justify his conclusion that the accounts are fair in presenting the state of affairs of the company at the balance sheet date and the results of its operations for the period. If the credibility of the audit function is to be maintained in the eyes of the users of financial statements, an assurance that standards of competence, independence, performance and reporting have been observed by the auditor is a necessity.

Few attempts at definition of auditing standards have been made by the accountancy bodies. One body which has made such an attempt is the American Institute of Certified Public Accountants and their efforts are next reviewed before proceeding to consider the present position in the United Kingdom.

3. Auditing standards in the United States

The following discussion of auditing standards in the United States concentrates mainly on describing the formal attempts at delineation of standards by the American Institute of Certified Public Accountants but also mentions briefly related topics such as the influence of the Securities and Exchange Commission in the formulation of standards, for example as regards independence.

The first attempt to formulate 'generally accepted

auditing standards' was made by the Committee on Auditing Procedure in a statement published in 1947⁶ and the proposals therein were adopted by the members of the AICPA shortly thereafter. The current formulation, together with a detailed discussion of the individual standards, is contained in Statement on Auditing Standards No. 1, entitled 'Codification of Auditing Standards and Procedures', which was issued to members in 1973. It is interesting to note that the initial pressure for the formulation of auditing standards emanated from the adoption of a requirement by the Securities and Exchange Commission in 1941 that a representation as to compliance with generally accepted auditing standards be included in all auditor's reports filed with the Commission. The Securities and Exchange Commission has always been ready to issue detailed rules and regulations as to filings with it since its inception under the Securities Exchange Act of 1934 as a guardian of the interests of the investing public.

The generally accepted auditing standards currently in force are divided into three main categories – general standards, standards of field work and standards of reporting – and are as follows:

General standards –

1. The examination is to be performed by a person or persons having adequate technical training and proficiency as an auditor.
2. In all matters relating to the assignment an independence in mental attitude is to be maintained by the auditor or auditors.
3. Due professional care is to be exercised in the performance of the examination and the preparation of the report.

Standards of field work –

1. The work is to be adequately planned and assistants, if any, are to be properly supervised.
2. There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.
3. Sufficient competent evidential matter is to be obtained through inspection, observation, inquiries and confirmations to afford a reasonable basis for an opinion regarding the financial statements under examination.

Standards of reporting –

1. The report shall state whether the financial statements are presented in accordance with generally accepted principles of accounting.
2. The report shall state whether such principles

⁶'Tentative Statement of Auditing Standards: Their Generally Accepted Significance and Scope'. American Institute of Accountants (1947).

have been consistently observed in the current period in relation to the preceding period.

3. Informative disclosures in the financial statements are to be regarded as reasonably adequate unless otherwise stated in the report.

4. The report shall either contain an expression of opinion regarding the financial statements, taken as a whole, or an assertion to the effect that an opinion cannot be expressed. When an over-all opinion cannot be expressed, the reasons therefor should be stated. In all cases where an auditor's name is associated with financial statements the report should contain a clear-cut indication of the character of the auditor's examination, if any, and the degree of responsibility he is taking.⁷

The first general standard corresponds to the 'competence standard' which was suggested in the previous section. What constitutes adequate technical training and proficiency is not made clear although in most states only Certified Public Accountants are permitted to express an opinion on published accounts. There is a uniform examination which candidates are required to pass before admission to membership. Other requirements for the granting of the CPA certificate normally include academic education and public accounting experience varying from one to five years, depending on state law and the applicant's educational qualifications. The current trend is to reduce or eliminate the experience requirement and place more stress on educational standards. The majority of the states now require applicants to possess university degrees, although not necessarily obtained in accounting. In the November 1965 examination 90 per cent of candidates taking the examination for the first time held first degrees and 22 per cent had either a higher degree or had engaged in some study at a graduate level.⁸ The trend towards limiting practical experience requirements is, I feel, regrettable. In order to practise effectively as a public accountant an individual must possess both a standard of education and wide practical experience, the one complementing the other. If this means that obtaining a professional qualification is a relatively long process then this must be accepted as the price which must be paid if an adequate standard of competence is to be maintained.

The second general standard is the 'independence standard'. As stated it stresses the mental attitude of the auditor and does not seek to define situations in which independence will be deemed to have been sacrificed. Help in this direction is however provided

by the Code of Professional Ethics of the AICPA, as follows:

Rule 101—Independence. A member or a firm of which he is a partner or shareholder shall not express an opinion on financial statements of an enterprise unless he and his firm are independent with respect to such enterprise. Independence will be considered to be impaired if, for example:

A. During the period of his professional engagement, or at the time of expressing his opinion, he or his firm

1. Had or was committed to acquire any direct or material indirect financial interest in the enterprise; or

2. Had any joint closely held business investment with the enterprise or any officer, director or principal stockholder thereof which was material in relation to his or his firm's net worth; or

3. Had any loan to or from the enterprise or any officer, director or principal stockholder thereof. This latter proscription does not apply to the following loans from a financial institution when made under normal lending procedures, terms and requirements:

(a) Loans obtained by a member or his firm which are not material in relation to the net worth of such borrower.

(b) Home mortgages.

(c) Other secured loans, except loans guaranteed by a member's firm which are otherwise unsecured.

B. During the period covered by the financial statements, during the period of the professional engagement or at the time of expressing an opinion, he or his firm

1. Was connected with the enterprise as a promoter, underwriter or voting trustee, a director or officer or in any capacity equivalent to that of a member of management or of an employee; or

2. Was a trustee of any trust or executor or administrator of any estate if such trust or estate had a direct or material indirect financial interest in the enterprise; or was a trustee for any pension or profit-sharing trust of the enterprise.

The above examples are not intended to be all-inclusive.⁹

The third general standard, which I would call a 'performance standard', merely states that due professional care must be exercised and requires little further comment. The standards of field work too fall into this category and are self-explanatory, although the omission of a standard requiring the

⁷As for ¹ at page 5.

⁸'Auditing Principles' at page 3. Howard F. Stettler (1970).

⁹For a lengthier discussion of independence and decisions of the SEC see 'Professional Ethics in Accounting', John L. Carey in 'Handbook of Modern Accounting Theory' ed. Morton Backer (1955).

preparation of adequate working papers is to be regretted.

The standards of reporting cover the points raised earlier in this paper but with a slightly different emphasis. The fourth standard incorporates the clear statement of audit scope and any restrictions thereon, the giving of an opinion and the reasons for any qualifications, and the statement that the examination is in accordance with generally accepted auditing standards. The first three reporting standards are concerned with the fairness of the information presented and deal with conformity with 'generally accepted accounting principles', consistency of application of these principles and the adequacy of informative disclosures. It would perhaps be pertinent at this stage to ask what are 'generally accepted accounting principles', but the answer is not likely to be very rewarding. The Accounting Principles Board spent eleven years before finally committing itself to the publication of a statement entitled 'Basic Concepts and Accounting Principles Underlying Financial Statements of Business Enterprises', and I can only echo the comments of one critic who had the following to say concerning this Statement:

' . . . This is a masterpiece in double talk on accounting. No document could be issued that would more aptly qualify for the recent title of a magazine article relating to the effort to improve accounting — "Words, Words, Words, —." This Statement is a 30,000-word document that can be read only with difficulty and determination. It is full of meaningless statements, obvious elementary observations, or plain misleading statements. To describe some of its contents to you is possible, but nothing can take the place of attempting to read it for yourself . . .'¹⁰

To avoid getting too deeply involved in a discussion which is not strictly relevant to the matter at hand I will pass on to considering the 'standard' short-form auditor's report currently in use in the United States referring in passing to a comment made by Stephen Gilman in 1939, who said that perhaps much of the problem of defining accounting principles stems from the fact that each accountant, although never preparing a list of principles himself, has been comfortably certain that someone else must have done so.¹¹

The standard form of short-form report in use in the United States is only a 'standard' in so far as it has been recommended as conveniently embodying

the reporting standards listed above, and currently is as follows:

We have examined the balance sheet of X Company as of June 30, 19—, and the related statements of income and retained earnings and changes in financial position for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the aforementioned financial statements present fairly the financial position of X Company at June 30, 19—, and the results of its operations and the changes in its financial position for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.¹²

A final comment in connection with standards of reporting covers the situations where accounting standards or accounting principles have not been complied with. In such circumstances, the Code of Professional Ethics of the AICPA states the following:

Rule 202—Auditing Standards. A member shall not permit his name to be associated with financial statements in such a manner as to imply that he is acting as an independent public accountant unless he has complied with the applicable generally accepted auditing standards promulgated by the Institute. Statements on Auditing Procedure issued by the Institute's committee on auditing procedure are, for purposes of this rule, considered to be interpretations of the generally accepted auditing standards, and departures from such statements must be justified by those who do not follow them.

Rule 203—Accounting principles. A member shall not express an opinion that financial statements are presented in conformity with generally accepted accounting principles if such statements contain any departure from an accounting principle promulgated by the body designated by Council to establish such principles which has a material effect on the statements taken as a whole, unless the member can demonstrate that due to unusual circumstances the financial statements would otherwise have been misleading. In such cases his report must describe the departure, the approximate effects thereof, if practicable, and the reasons why compliance with the principle would result in a misleading statement.

The above standards of auditing, when read in conjunction with the Code of Professional Ethics and in the context of the ever watchful eyes of the Securities and Exchange Commission and the willingness of

¹⁰'The Significance of Recent and Pending Opinions of the Accounting Principles Board', Leonard Spacek at page 16. A speech delivered to Conference on Public Disclosure and the Corporation, The Conference Institute, New York on November 19, 1970.

¹¹'Accounting Concepts of Profit' at page 169. Stephen Gilman (1939).

¹²As for ¹ at page 81.

the American investor to engage in litigation go a long way to ensuring that an adequate service is provided to investors and other readers of financial statements by the accountant as auditor.

The decision in the Continental Vending case must also be kept in mind in considering the need to review, improve and enforce prescribed auditing standards. In this case it was agreed that compliance with professional standards which are inadequate to ensure a fair presentation of facts to investors does not constitute a valid defence. The interests of the readers of published accounts must come first.¹³

Having completed this brief review of the American attempt at defining auditing standards, attention must now be directed at the United Kingdom scene. The major assertion underlying the comments which follow is not that auditors do not have standards in the United Kingdom, nor that they are likely to be inadequate, but that it is extremely difficult to find formal and authoritative statements of what these standards in fact are.

4. Auditing standards in the United Kingdom

The sources from which statements of auditing standards can be derived are the Companies Acts 1948 and 1967 and the various pronouncements of the professional bodies. This review is limited to the statements of the Institute of Chartered Accountants in England and Wales. However, the comments that follow are of general application throughout the United Kingdom, and the views of the Scottish and Irish Institutes do not conflict significantly with those of the English Institute.

A number of cases concerning auditors and their duties have been decided at various times, particularly at the turn of the nineteenth century. These decisions are of limited relevance to the discussion that follows firstly because of their relative antiquity and the changes which have occurred in business and auditing practice, and secondly because the decisions are too specific to the circumstances of each case to enable useful general propositions concerning auditing standards to be drawn. Limited reference is however made to cases in discussing the concept of due care as it affects the auditor.¹⁴

While the Companies Acts lay down requirements with which the auditor must comply, the English

Institute has preferred to rely on persuasion rather than compulsion in most instances. Statements covering many topics have been 'issued for the guidance of members' and, as I will seek to show below, have touched upon many of the areas in which I feel there exists a need for an authoritative delineation of specified standards which the auditor must uphold without going so far as to say that this is the way things will be done. This reluctance to lay down definitive standards so far as members are concerned seems to be on the decline at least in the area of accounting standards as evidenced by the following extract from the Explanatory Foreword to the Statements of Standard Accounting Practice, which states that:

'The Council expects members of the Institute who assume responsibilities in respect of financial accounts (signified by the association of their names with such accounts in the capacity of directors or other officers, auditors or reporting accountants) to observe accounting standards. The onus will be on them not only to ensure disclosure of significant departures but also, to the extent that their concurrence is stated or implied, to justify them. The Council, through its Professional Standards Committee, may inquire into apparent failures by members of the Institute to observe accounting standards or to disclose departures therefrom.'

The standards of auditing which have been formally specified and the areas of omission will be considered under the four categories used earlier in this paper – competence, independence, performance and reporting.

Section 161(1) of the 1948 Act specifies the qualifications for appointment as auditor of a company. A person is not qualified for appointment as auditor unless either he is a member of a body of accountants established in the United Kingdom and for the time being recognised by the Department of Trade and Industry, or is authorised by the Department of Trade and Industry as having similar qualifications obtained abroad, as having adequate knowledge and experience obtained as an employee of a member of a recognised body, or as having practised as an accountant in Great Britain before 6 August 1947. The last qualification will no longer be accepted from new applicants for recognition.¹⁵ The United Kingdom bodies currently recognised as competent to act as auditors are the three Institutes of Chartered Accountants and the Association of Certified and Corporate Accountants. Each of these bodies specifies its own experience and educational

¹³For further details see 'The Continental Vending Case: lessons for the profession,' David B. Isbell, in *The Journal of Accountancy*, August 1970 or *Canadian Chartered Accountant*, October 1970.

¹⁴For a detailed discussion of cases together with full reports see 'Accountants and the Law of Negligence', R. W. V. Dickerson (1966).

¹⁵Companies Act 1967, Chapter 81, Section 13(4), HMSO

requirements and sets its own examinations. In addition to passing examinations the predominant method of qualification for an aspiring accountant is from three to five years working under articles to a member of one of the accounting bodies in public practice. The profession is as yet far from being restricted to a graduate entry, although the number of graduate articulated clerks has been steadily increasing during the last few years.

The training and education requirements of the profession as a whole are currently the subject of much debate. Suggestions for improvement are mainly concerned with such areas as the modification of examination syllabuses, provision of full-time training courses and raising of the minimum educational requirements for entry. The defeat of the proposals for integration of the various accounting bodies has prevented any uniform or concerted attempt at solution of the many problems in this area from being made. The development of sound policies for the induction and training of future generations of accountants is absolutely vital if the profession is to continue to maintain an adequate standard of competent service and thereby justify its standing in the business community.

The problem of ensuring that an adequate standard of independence is maintained by the auditor in conducting his audit is partially solved by the provisions of Section 161(2) of the 1948 Companies Act which states that certain categories of person are automatically disqualified from appointment as auditor of a company. The three categories specified are officers or servants of the company, persons who are partners of, or employed by, officers or servants of the company, and bodies corporate. The statements of the Institute on professional conduct and on auditing are strangely silent concerning the topic of independence as are the royal charters and by-laws. Clause 20 of the Supplemental Royal Charter of 1948 lays down five 'fundamental rules of the Institute' for breach of which a member may be excluded from membership or otherwise disciplined. These rules are concerned with the integrity of the profession but not its independence.

No objection is formally raised to an auditor or one of his partners having a financial interest in the company which he is auditing and this situation does arise in practice. In discussing the ethical problems involved in providing management consultancy services to clients no mention is made of potential conflict of duties and the need for independence of attitude on the part of the auditor. Instead the discussion is concerned with ensuring that the consultant does not acquire auditing and tax work at the expense of the existing auditors.¹⁶ The only

guidance given to members in this area is contained in the concluding paragraph of Statement on Auditing U1 which says that 'the accountants should not undertake services which would impair their independence as auditors' without making any attempt to specify the types of services involved. The whole approach of the Institute in this area, and in the wider area of auditing standards generally, is perhaps best illustrated by two quotations, one taken from Statement on Professional Conduct E1 and the other from a paper delivered by S. M. Duncan to the European Congress of Accountants in 1963:

'The Institute has no detailed written code of conduct. There are the fundamental rules . . . and also the matters listed in clause 21 of the Supplemental Royal Charter . . . of which item (3) relates to "any act or default discreditable to a public accountant or a member of the Institute". There is no list of matters which are discreditable. From time to time the Council issues statements for the guidance of members and these are shown in succeeding parts of this section E . . .'

'There is no statutory rule prohibiting an auditor of a company from holding shares in the company. Nevertheless, the professional accountant should be aware of the need for the auditor to avoid being placed in a situation where he might be in danger of failing to preserve or to appear to preserve his independence of outlook.'¹⁷

Turning next to performance standards, reference must be made to a statement made by the Accountants International Study Group in one of their publications that:

'The English Institute has published a statement, "General Principles [*sic*] of Auditing", which covers the general standards and standards of field work which are included in generally accepted auditing standards in the U.S.'¹⁸

Although the above-mentioned statement contains comments on many aspects of auditing and is highly readable and informative, I do not feel that it can be regarded as covering the general and field work standards as promulgated by the American Institute of Certified Public Accountants by any reasonable stretch of the imagination.

The standard of care required from an auditor in the performance of his duties was summarised neatly in two cases decided at the turn of the century.

¹⁶Statement on Professional Conduct No. 6 - 'Consultancy'. Circulated to members in March 1970, Institute of Chartered Accountants in England and Wales (ICAEW).

¹⁷As for ⁴ at page 150.

¹⁸'The Independent Auditor's Reporting Standards in three Nations' at paragraph 36. Accountants International Study Group (1969).

Although the persons to whom a duty of care is owed have been extended by the decision in the *Hedley Byrne* case in 1963,¹⁹ the summaries which follow, and which are incidentally given in paragraphs 2 and 3 of Statement U1, still indicate the attitude of the law to the standard of care which is expected. The first quotation is from Lord Justice Lopes's judgement in *In re Kingston Cotton Mill Co Ltd* (1896)²⁰, and the second from Lord Justice Lindley in *In re London and General Bank* (1895).²¹

'It is the duty of an auditor to bring to bear on the work he has to perform that skill, care, and caution which a reasonably competent, careful, and cautious auditor would use. What is reasonable skill, care and caution, must depend on the particular circumstances of each case . . . If there is anything calculated to excite suspicion he should probe it to the bottom; but in the absence of anything of that kind he is only bound to be reasonably cautious and careful . . . The duties of auditors must not be rendered too onerous. Their work is responsible and laborious and the remuneration moderate . . .'

'He must be honest – that is, he must not certify what he does not believe to be true and he must take reasonable care and skill before he believes that what he certifies is true. What is reasonable care in any particular case must depend upon the circumstances of that case'.

Statement U1 goes on to stress the importance of a proper evaluation of the system of internal control in force at a client and states that 'auditors should therefore direct their attention in the first instance to the system of internal control'²² and the type of work to be done and consideration to be kept in mind are spelled out in some detail. No mention is made however of the need for adequate standards of planning, supervision and review in conducting an audit. Nor is the subject of competent evidence to be acquired in support of an opinion discussed.

Statement U12²³ does deal with the topic of auditors' working papers and concludes that no conclusion or firm recommendation is necessary, being limited to a purely descriptive statement of the benefits to be drawn from the preparation of working papers and their possible content in broad outline. Little authoritative guidance is therefore available to

members as to the standards of performance expected from them in their work as auditors.

Section 14 of the 1967 Companies Act deals at length with the required content of the auditor's report, while Statement on Auditing U10 discusses the form of the report and the problems posed by desired qualifications of the basic report. The requirements of Section 14 are conveniently reproduced in the first part of Statement U10 and are briefly as follows:

'Auditors are required by Section 14(3) to state expressly whether in their opinion the accounts on which they are reporting give a true and fair view and have been properly prepared in accordance with the provisions of the Companies Acts 1948 and 1967. If they are unable to report affirmatively in the required respects they must say so . . .

Auditors are required also to form an opinion whether:

- (a) proper books of account have been kept by the company;
- (b) proper returns adequate for their audit have been received from branches not visited by them;
- (c) the accounts are in agreement with the books of account and returns.

It is their duty to report on these matters only if, in their opinion, these requirements have not been complied with. The absence of any comment in their report is therefore equivalent to a positive statement by the auditors that they have investigated and satisfied themselves on all these matters. Likewise their report must state, if such is the case, the fact that they have not obtained all the information and explanations which, to the best of their knowledge and belief, were necessary for the purposes of their audit.²⁴

Nowhere does the Act attempt to define what is meant by the expression 'a true and fair view' of the state of the company's affairs as at the end of its financial year and of the company's profit or loss for its financial year, to quote from the 1967 Act itself.²⁵ The expression was introduced in the 1948 Act and replaced 'true and correct view' as required by the 1900 Companies Act.²⁶ The word 'true' in its normal usage means 'in accordance with fact or reality' or 'conforming to the appropriate standard', while 'fair' means just and equitable. From these definitions it seems that the accountant's 'truth' corresponds more closely to the second definition offered than to the

¹⁹For further detail see 'Accountants' liability to third parties – the *Hedley Byrne* decision', Statement V8, ICAEW, August 1965 and reference 14 at pages 88 to 93.

²⁰(1896) 2 Ch. 279 at pages 288–90.

²¹(1895) 2 Ch. 673 at page 683.

²²General Principles of Auditing', Statement on Auditing No. 1 at paragraph 9. ICAEW, August 1961.

²³'Auditors' Working Papers', Statement on Auditing No. 12. ICAEW, June 1969.

²⁴'Auditors' Reports: Forms and Qualifications', Statement on Auditing No. 10. ICAEW, August 1968 at paragraphs 1 and 3.

²⁵Companies Act 1967, Chapter 81, Section 14(3), HMSO.

²⁶Companies Act 1900, Sections 21–23, reproduced in reference 5 at pages 395–6.

first, since the accounting conventions used in valuing assets and the claims against them can produce a rather unreal reality. If such is the case then there is some justification for the effort to establish appropriate standards which is at present being made. The requirement previously mentioned that disclosure and justification of departures from standard accounting practices must be made by the auditor seems in this context a desirable reporting standard to have established.

Fairness on the other hand must involve potentially antagonistic parties with conflicting interests and has heavy legal overtones. A fair view as regards whom seems to be the relevant question. Presumably a fair view as regards the respective rights of shareholders and creditors when deciding how best to measure assets and claims against them, and a fair view for the shareholders and management of the latter's performance during the financial year covered by the accounts.

Considering the difficulties inherent in attaching a clear meaning to the apparently innocuous and much misunderstood phrase 'a true and fair view', one cannot but admire the supreme self-confidence of the President of the Institute who was able to state in 1894 that 'examined and found correct' was as satisfactory a certificate as an auditor could possibly give, provided it was given by a person of integrity.²⁷ Furthermore the adequacy of these five little words as an expression of opinion can seriously be called into question.

The recommended form of auditor's report for use in the United Kingdom is worded as follows:

'In our opinion, the accounts set out on pages . . . to . . . give a true and fair view of the state of the company's affairs at . . . and of its profit (or loss) for the year ended on that date and comply with the Companies Acts 1948 and 1967.'²⁸

The report makes no mention of whether or not the accounts have been prepared in conformity with generally accepted accounting principles, or standard accounting practices as defined by the Institute. Neither is mention made of the consistent application of these principles and practices, best called 'conventions', as between the current and preceding period. Yet, if one reads the section of Statement U10 which deals with the circumstances in which a qualification is felt to be necessary,²⁹ there is no doubt that any departure from accepted conventions or failure to disclose details of inconsistent appli-

cation thereof together with any other lack of necessary informative disclosure, whether or not required by the Companies Acts, will necessitate a qualification of the auditor's report.

The use of a scope paragraph setting out the statements examined and the conformity of the work done with generally accepted auditing standards is regarded as purely optional. The first omission is not serious and is remedied in the opinion paragraph. The second omission is serious, if understandable in the absence of defined standards of auditing.

The standards of reporting in the United Kingdom are in my view inadequate to ensure that the reader of an auditor's report attached to financial statements fully understands the nature and limitations of the report itself and the accounts which it accompanies. The delineation of required standards of reporting to supplement the statutory requirements and the expansion of the auditor's report to include statements on the American lines would constitute an improvement.

An assessment of auditing standards in the United Kingdom in comparison with the criteria derived in section (2) of this paper follows as part of the conclusion on the points discussed in the paper as a whole.

5. Conclusion

This paper has sought to examine the topic of auditing standards at some length by first attempting to deduce the areas which such standards should cover given the objectives of an audit and then discussing the standards which have been formulated in the United States. Finally the position as it exists in the United Kingdom has been outlined. All that remains is to pull the threads together by briefly commenting upon the situation currently existing in the United Kingdom and pointing out any deficiencies which exist when measured against the criteria derived earlier in the paper, and by drawing any overall conclusions which seem pertinent.

In the first paragraph of this paper, I said that its primary purpose is not to defend or criticise the existing situation, and this remains the case. I would further add that writing a few carefully chosen words on a piece of paper and circulating it to members as an authoritative statement of auditing standards will not automatically ensure that standards will improve. Nor does the lack of such a statement necessarily mean that standards are non-existent or require drastic improvement. The presence of an authoritative written statement does however help to remove ambiguity from the minds of all concerned, and is the most convincing evidence that some attention and thought have been given to the matter.

²⁷As for ² referred to at page 52.

²⁸As for ²⁴ at paragraph 16(a).

²⁹As for ²⁴ at paragraphs 6 and 7, and in particular at paragraph 6(d).

How then do United Kingdom auditing standards fare? Considering each of the four suggested groupings in turn, standards of competence can be regarded as reasonably satisfactory although there remains much room for improvement in the area of training and education of new entrants. The required standards of independence are not sufficiently stringent and more attention needs to be given to the outward signs of independence, in particular the banning of any financial interests in client companies.

Performance standards again do not seem to have received adequate attention in the United Kingdom and there is a marked reluctance towards going further than merely offering guidance to members in these important matters. Standards of reporting again seem to be inadequate in that the auditor's

report is singularly uninformative, if not misleading, to the non-accountant reader unversed in its mysteries. Auditing standards in the United Kingdom leave a lot to be desired as I hope this paper may have shown.

The standing of the profession as a whole has been subject to much adverse comment, if one is to judge from the criticisms raised against it from both inside and outside in recent years. Its leaders in taking the necessary action, which I am sure they will, hopefully will see fit to consider the important problem of formalising and establishing adequate standards of auditing, perhaps touching on some of the issues raised in this paper. It would be a poor policy indeed to wait until a major court case or a financial scandal comes along before admitting that there is room for improvement.

An Early English Cotton Mill Cost Accounting System: Charlton Mills, 1810-1889

Williard E. Stone

The mill ledger of the Charlton Mills of Manchester, England, with its earliest account beginning 1 September 1810, discloses the use of an amazingly complete cost accounting system. The cost records were integrated with a double entry system which produced a balanced trial balance on a bi-monthly basis. Many features of modern cost accounting found in this 1810 set of records¹ were not believed to have been in use until the early twentieth century. Prime costs for labor and materials were collected for each of fourteen cost centers and general expenses were allocated to these centers using predetermined rates. Transfers of materials-in-process between cost centers made use of intracompany pricing. A manufacturing gain or loss for each of thirteen of these cost centers and the selling profit or loss from the warehouse room were included in the bi-monthly trial balance.

The English Cotton Industry and the Charlton Mill

The English cotton industry began with hand spinning and weaving of cotton in the early 16th century. Cotton was first used in combination with wool or linen because hand spun cotton thread lacked the necessary strength for weaving.² It was not until the invention of spinning machinery that pure cotton cloth was manufactured in England. In 1738, Lewis Paul patented a method of spinning cotton thread over rollers and the hand weaving of cotton cloth probably began then. In 1764 Crompton patented the

'mule' which produced a high strength thread.³ Power looms and improvements to the mule were developed by Arkwright, Hargreaves and Cartwright over the following twenty year period and the manufacture of cotton cloth became a major industry in England.⁴ By 1785 English cotton mills employed 30,000 individuals and had invested capital of £300,000.⁵

Charlton Mills probably came into existence sometime in the period 1764 to 1785 but nothing is known of the owner or of the company's accounting system prior to 1810. Because of balances carried forward from a prior ledger, it is clear that the mill was in operation at an earlier date with a fully developed accounting system as described in this paper.

In 1810 the mill, engaged only in spinning cotton, was owned by Hugh Hornby Birley and his brother Joseph Birley. It was located by the river on the east side of Cambridge Street in Manchester. Owners' capital of £20,189 indicated a large and well established business in 1810. The later years of the Napoleonic Wars were unusually profitable ones for Charlton.⁶

| Year Ending | Average Capital | Profit | Return on Capital |
|------------------|--------------------|---------|----------------------|
| 3 July 1813 | £56,554 | £10,094 | 17.8% |
| 2 July 1814 | 42,462 | 57,536 | 135.2 |
| 1 July 1815 | 61,646 | 8,558 | 13.9 |
| 29 June 1816 | 63,483 | 18,807 | 29.6 |
| Per Year Average | £56,036 | £23,749 | 42.4% |

¹ The original waste books and ledgers of Charlton Mills for the period 1810 to 1889 are in the Florida Accounting Archives in the University of Florida Library. The journals and stock papers have not been preserved. I am grateful to Dr. William Woodruff, Research Professor of Economic History, University of Florida, who secured these records and directed my attention to their importance.

² Sir Spencer Walpole, *A History of England*, Vol. 1, London and New York, Longmans, Green & Co., 1890, p. 88.

³ Edward Baines, *History of the Cotton Manufacture in Great Britain*, London, H. Fisher, R. Fisher and R. Jackson, Preface - Leeds, January, 1835, p. 122.

⁴ Edward P. Cheyney, *An Introduction to the Industrial and Social History of England*, New York, Macmillan Company, 1905, p. 210.

⁵ Baines, op cit., p. 184.

⁶ The average return on capital for the balance of the years from 6 July 1811 to 25 June 1825 was 6.78%. 1826 to 1828 were loss years.

Profits for this period were largely withdrawn by the owners for other ventures as disclosed in the investment accounts of the private ledger. Construction of a new mill was begun in 1815 and these funds plus venture profits were gradually returned to the business. In 1817 the Company extended its operations to the weaving of cotton cloth and calicos.⁷ By 30 June 1821 the invested capital had reached £160,752.

In 1824 the Birleys expanded the Company's operations further by admitting Charles Macintosh and R. W. Barton as partners.⁸ The new company operated under the name of Charles Macintosh & Co. In the late 1820's a part of the new mill was converted to treat cotton cloth with rubber to produce shoes, raincoats and a type of rubberized pipe. Certain types of waterproof boots and clothing are still referred to as 'macintoshes.' The new company was apparently quite successful in its early years but competition and extensive lawsuits in later years brought hard times to the company and operations were discontinued in 1889.

The Manufacturing Process in 1810

Operations began with the purchase of raw cotton from India, Egypt, the West Indies and the United States which exported 'Alabama', 'Georgia' and 'New Orleans' cotton. Bales were opened in the warehouse and the cotton cleaned before transfer to one of five carding rooms. There the fibers were straightened and spun into soft, thick threads called *rovings*. Rovings were transferred to eight spinning rooms where power driven spinning jennies produced strong cotton thread known as *twist* or *weft*. The twist was transferred back to the warehouse as finished product and sold from there.⁹ The accounting system clearly reflects this manufacturing procedure.

The Accounting System

Although a complete set of accounting books and records has not been preserved, enough remains to reconstruct the accounting system in use in 1810 and to determine that it was double entry with the cost records integrated into the system.

The waste book was the usual memorandum or day book. The debits from the sales journal were posted

to the customers' accounts in the general ledger but sales totals were posted bi-monthly to the warehouse trading account in the mill ledger. Both the cash journal and the purchase journal were together in the (CB) book. Most posting went to the general ledger but labor and cotton costs were posted directly to the trading accounts. No general journal was in use and transfer entries (i.e. the allocation of general expenses to the trading accounts) were made without journal entries. Stock papers are referenced as the source of bi-monthly entries for closing inventories to the trading accounts. A general ledger, private ledger and mill ledger contained the accounts of the business. Fortunately the mill ledgers have been preserved for the entire period 1810 to 1889. They contained the trading accounts for warehouse, each of five carding rooms and eight spinning rooms and the trial balances for each two month period. The plant and equipment accounts were also kept in the mill ledger. Figure 1 charts the relationship of the accounting books and the flow of the major types of transactions.

The Charlton accounting system contained cost accounts which followed the cost flow of the mill's manufacturing process.

Raw cotton costs were charged to the warehouse trading account at purchase price plus freight-in. Wages were charged to the warehouse account for the cleaning process. The cotton was then transferred at prime cost to the five carding rooms. Since cotton from different locations (i.e. Egypt, New Orleans, etc.) had a considerable price differential the cost charged to each carding room varied according to the price paid for the raw cotton.¹⁰ Each of the five carding rooms was treated as a cost center and direct labor expended was charged separately to each room. An allocation for general expense was made to each room. Rovings, the product of the carding rooms, were transferred to eight spinning rooms. Waste was transferred to the warehouse and a credit given the carding rooms. Each spinning room had its own account in the mill ledger and was a cost center. Transfers of rovings were made at an intracompany price.

Direct labor and allocated general expense were

¹⁰ In April 1832, for example, the following prices were quoted in Liverpool (in pence):

| | | |
|-------------|-----------------|------------------------|
| New Orleans | - fair | 6 1/8 to 6 3/4 per lb. |
| | - good | 6 7/8 to 7 3/8 per lb. |
| | - prime | 7 1/2 to 8 1/4 per lb. |
| Georgia | - fair | 5 3/4 to 6 3/8 per lb. |
| | - good to prime | 6 3/4 to 7 1/4 per lb. |
| Surat | - ordinary | 4 3/8 to 4 3/4 per lb. |
| | - good | 4 7/8 to 5 1/2 per lb. |
| Egyptian | - | 9 to 9 3/4 per lb. |

(Baines, op. cit., p. 312.)

⁷ The 28 June 1817 trial balance disclosed a change in the chart of accounts to include cost centers for weaving of cotton cloth and printing of calicos.

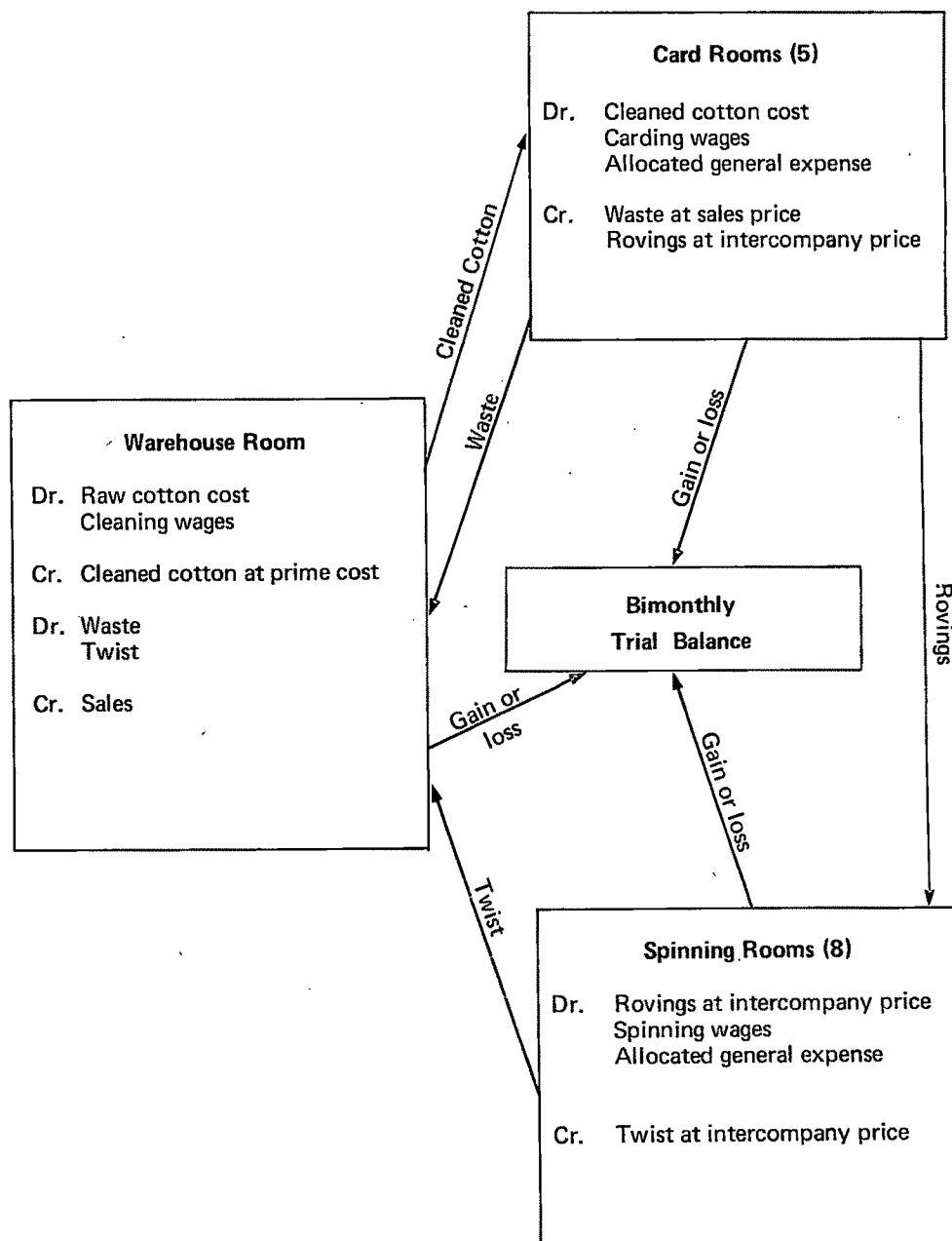
⁸ William Woodruff, *The British Rubber Industry during the Nineteenth Century*, Liverpool University Press, 1958, p. 5.

⁹ For a more complete description of the cotton manufacturing process in early eighteenth century England, see Baines, op. cit., p. 118 and p. 242.

| Dr | | Cr | | 134 |
|--------------------|---------------------------|--------|------------|-------------|
| 51 | By Cash of Bills | | 322 | 8 8 |
| 10 | By Mechanics Ac. | | 4,928 | 3 5 1/2 |
| 13 | By Ballston Wall St Co | | 4 | 14 3 |
| 17 | By Line | | 9 | |
| 20 | By Jo - Key | | 30 | |
| 30 | By House | | 979 | 15 - 1/2 |
| 36 | By Geo Reid | | 17 | 3 - |
| 45 | By W Jackson | | 5 | 1 - |
| 47 | By M Head | | 3 | - |
| 50 | By Sundries | | 262 | 5 8 1/2 |
| 78 | By Wm England | | 284 | 1 1 1/2 |
| 87 | By John Smith | | 49 | 5 - |
| 104 | By Building | | 925 | 18 3 |
| 111 | By A. P. Jackson | | 40 | - |
| 103 | By Gallimore Johnson & Co | | 705 | 14 0 |
| 164 | By Elliot | | 28 | 6 - |
| 166 | By W Moore | | 111 | 3 - |
| 167 | By Geo Gallimore Jun | | 25 | 11 - |
| 174 | By J. W. Hornsby & Co | | 653 | 2 2 |
| 179 | By Geo Callow | | 31 | 12 - |
| 185 | By R. J. C. Clapton | | 713 | 2 - |
| 197 | By Machinery | | 13401 | 2 9 |
| 209 | By Genl Expenses | | 15360 | 11 - |
| 215 | By Geo Brighten | | 12 | 18 - |
| July 15 To Balance | 6,613.17 1/2 | Apr 11 | 375 23 1/2 | to Knicker |
| Apr 11 To Cash | 200 | | 35 1 | Land Loan |
| 2 | 200 3/4 | | 395 15 2 | " |
| 3 | 5.15.3/4 | | 20 3 | " |
| 4 | 7.12.2 | | 25 4 | " |
| 5 | 1. 1.1 | | 31 5 | " |
| 6 | 11. 7.8 1/2 | | 36 1 | Spring Loan |
| 7 | 12.11 1/2 | | 32 2 | " |
| 8 | 14.11.9 1/2 | | 24 3 | " |
| 9 | 13. 17. 1/2 | | 30 4 | " |
| 10 | 2. 4.5 1/2 | | 27 5 | " |
| 11 | 8. 16.10 | | 16 6 | " |
| 12 | 5. 8. 8 | | 26 7 | " |
| 13 | 2. 15. 1 | | 19 8 | " |
| 14 | 1. 5. 3 | | 33 | House Loan |
| 15 | 833. 6 1/2 | | 14,344 | 2 - |
| 16 | 27,524.12.4 1/2 | | 62,462 | 1 7 1/2 |
| 17 | 27,524.12.4 1/2 | | | |

Figure 2. Manufacturing Process and Cost System-Charlton Mills

MILL LEDGER ACCOUNTS



charged to the spinning room accounts. Twist, the finished product, was transferred back to the warehouse also using an intracompany price. The warehouse trading account was credited at sales price for the sales of twist to customers.

Each account for the five carding rooms, the eight spinning rooms and the warehouse was balanced at the end of a two months period. The credit in these accounts for the closing inventory was referenced to 'stock papers' indicating that physical inventories were taken. A bi-monthly gain or loss was computed for each cost center. Figure 3 presents a typical cost center account for the two month period ending 11 April 1812.

The gain or loss from each cost center was carried to the bi-monthly trial balance. The £14/11/9½ profit from spinning room No. 2 of Figure 3 is found listed at the bottom of the 11 April 1812 trial balance, Figure 4.

The trial balance presented has several interesting features. Revenue, liability, owners' equity accounts and the total profit for the year to date ('To Balance 7,524/12/4½') appear as debits and the balances from the asset accounts appear as credits in the trial balance. The accounts in the ledger follow U.S. debit and credit rules (i.e. asset accounts have debit balances) but the amount necessary to balance the accounts was carried to the trial balance. This practice probably explains the English custom of preparing the balance sheet with the assets on the right.

To reconcile the plugged in profit figure, the gain to date of the prior trial balance was listed together with the profits of the individual carding rooms,

spinning rooms and warehouse stock room. This profit breakdown appeared on either the equity or asset side of the trial balance. The figures added to the Cr. column at the bottom of Figure 4 are the inventories of each cost center as of 11 April 1812. In Figure 3 the closing inventory of spinning room No. 2 is £23/15/3½. This figure appears, properly labelled, in the trial balance, Figure 4.

Allocation of General Expenses

The general expense account was charged with debits for containers, carting, packing, advertising, legal expense, taxes and the London sales allowance as these expenses were incurred (on the accrual basis). Twice annually the general account was charged with depreciation, generally at a five per cent annual rate but frequently with an extra amount to bring the building and equipment accounts to an even thousand £ figure. There was also a tendency to charge larger amounts of depreciation in profitable years indicating that income smoothing is not a new idea. General expense was also charged with imputed return on capital invested by the owners at a five per cent per annum rate. Because imputed interest of five per cent for the period of construction was added to the plant accounts, general expenses, through the charge for depreciation, contained some duplication of imputed return on capital.

Allocations of general expenses were charged to the carding and spinning room cost centers bi-monthly using apparently arbitrary amounts which differed by center but were a constant amount for each center

Figure 3

SPINNING ROOM No. 2 ACCOUNT IN MILL LEDGER

(words in parentheses added)

| Dr. No. 2 Spinning Room | | | | | Con* (Contra) Cr. (Page) 32 | | | | |
|-------------------------|------------------------------|--------------|-----|---------------|-----------------------------|-------------|---------|--------------------|---------------|
| 1812 | | (Folio) | | | 1812 | | (Folio) | | |
| Feb. 15 | To Stock | a Fo(ward) | 10 | £22 12 - | April 11 | By 1452 lbs | 37 | Twist 2/ 4½ | 33 £1,739 7 6 |
| April 11 | To Wages | Lr(Ledger) | 139 | 203 2 - | " | By Stock | 97 | Rovings 21½ 8/11/9 | |
| " | To Gen ^L Expenses | " | 209 | 110 - - | | | 155 | " 23½ 15/3/6½ | 23 15 3½ |
| " | To Rovings | No 3 8763.13 | 23½ | 20 | | | | | |
| | | No 5 6265.3 | 21½ | 31 1,412 17 - | | | | | |
| " | To Profit | | | 14 11 9½ | | | | | |
| " | To Stock | | | £23 15 3½ | £1,763/2/9½ | | | | £1,763 2 9½ |

for a period of one or two years. No allocation was made to the warehouse stock account where the selling profit was computed. This practice resulted in a very large balance of under-absorbed general expenses which appears to have been an embarrassment to the book-keeper. An increasing debit balance in the general expenses account was carried on from 1810 to 1813 (in the 11 April 1812 balance sheet, Figure 4, it amounted to £15,360/11/0 which resulted in a considerable overstatement of profits). In 1813, a £15,038/10/0½ debit balance was charged to the building account. After that date the allocations to cost centers were increased sufficiently to leave a small credit balance in the general expenses account. This credit balance was transferred to the owners' capital accounts annually.

Intracompany Pricing

The transfer of cleaned raw cotton from the warehouse to the carding rooms was made at prime cost which clearly reflected a differential according to type of cotton and grade. The intracompany price for transfer of rovings to the spinning rooms and for twist to the warehouse was not at cost but the exact basis for the price cannot be determined. The price differs, apparently, because of grade of cotton, for transfers from within one room. A uniform price, however, was established for transfers for the same grade of rovings to different rooms for each bi-monthly period. Likewise an intracompany price was determined bi-monthly, by grade, for transfer of twist from the spinning rooms to the warehouse room. It is clear that the price is not a cost-plus price because on occasion it threw up losses in individual carding or spinning room accounts. It is unlikely that a market price was used because the intracompany cost center profits were quite small compared to the warehouse profit which was based upon the selling price of the final product. Figure 4, for example, indicates a profit of £14/11/9½ for spinning room No. 2 which had the largest profit of all manufacturing cost centers for the bi-monthly period ending 11 April 1812. For the same period the ware-

house stock disclosed a profit of £833/6/0. All that can be said with certainty is that an intracompany price, generally above prime cost plus apportioned general expenses, was used to measure the manufacturing efficiency of the carding and spinning rooms. Obviously this computation of the comparative profitability of the various rooms had a management purpose.

Conclusions

Johnson in his article in the 1972 Winter issue of the *Business History Review*¹¹ points out that it has been generally believed that modern cost accounting methods were not in general use before the late nineteenth century. He directs attention to such authors as A. C. Littleton, D. Solomons, S. P. Garner and M. Chatfield who appear to have been in agreement that 'During the decades 1820-1880 little can be found which is of interest in the development of cost accounting . . .'¹² Johnson, with the records of the Boston based Lyman Mills Corporation, demonstrated that a double entry cost accounting system including work-in-process accounts was in use in America beginning in 1856.

The Charlton Mills records push this frontier back by almost fifty years. In 1810 and perhaps even before 1800, this company utilised a sophisticated system of cost finding. Such features as cost centers, allocations of general expenses and intracompany pricing have been thought to be innovations of the twentieth century. Perhaps even imputed return on capital which the Charlton Company used in 1810 will be adopted in future improvements of our cost accounting systems.

¹¹ H. Thomas Johnson, *Early Cost Accounting for Internal Management Control: Lyman Mills in the 1850s*, *Business History Review*, Vol. XLVI, No. 4, Harvard Graduate School of Business Administration, Boston, p. 467.

¹² S. Paul Garner, *Highlights in the Development of Cost Accounting Thought in Contemporary Studies in the Evolution of Accounting Thought*, Michael Chatfield Ed., Dickinson Publishing Company Inc., Belmont, California, 1968, p. 216.

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Volume 4 No 13 Winter 1973

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Williard E. Stone, CPA, PhD, taught accounting at the Wharton School of the University of Pennsylvania for fourteen years and has been professor of accounting and departmental chairman at the University of Florida since 1960. He was a visiting professor at the University of New South Wales, Sydney, Australia in 1966 and at the University of Virginia in 1972-73. A lifetime interest in history, particularly with respect to accounting brought forth 'Antecedents of the Accounting Profession' in the April 1969 *Accounting Review*. This interest continues and the present article is one of several currently under research.

E. Stephenson, aged 48, has a first class honours degree in Physics and an MSc degree from the University of Liverpool and an MBA degree from the University of New South Wales. From 1952 to 1969 he worked in the nuclear power industry as a senior scientist concerned with the design and commissioning of nuclear reactors. Since 1969 he has been a member of the staff of the Department of Business Studies, University of Liverpool, where he is senior lecturer in quantitative methods. His current research interests are the application of systems dynamics to the analysis of inventory decision processes in manufacturing industry and to the analysis of the UK private housing market.